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ANÆSTHETICS IN HEART DISEASE.[1]

By John M. T. Finney, M.D.,

ASSOCIATE PROFESSOR OF SURGERY, JOHNS HOPKINS UNIVERSITY, BALTIMORE.

"In every case in which an anæsthetic is to be administered there are three factors which contribute each an element of uncertainty to the result:

"1. The special action of the agent employed.

"2. The peculiarities or idiosyncrasies of the patient as to susceptibility.

"3. The skill with which the agent is administered."

These words of Sir George MacLeod, spoken some years ago in a discussion on anæsthetics before the Medico-Chirurgical Society of Glasgow, apply with peculiar force to the subject which we are about to discuss.

I wish to make acknowledgment here of my indebtedness to Drs. Tinker, Dabney, Brown, and Pancoast, who, with no little labor, have compiled the statistics for me from the records of the Johns Hopkins Hospital, the Union Protestant Infirmary, and also Dr. Kelly's private sanatorium, which he kindly placed at my disposal.

The literature upon the subject of anæsthetics in general, and their effects, physiological and pathological, upon man and the lower animals, is very voluminous. Carefully recorded observations with reference to the particular effects these anæsthetics have been observed to produce in patients suffering from lesions of the heart are correspondingly meagre.

Much speculation has been indulged in by some writers as to what would take place if certain anæsthetics were administered in certain

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impaired conditions of the heart, and not a few dogmatic statements are to be found here and there setting forth the dire calamities which are sure to befall, and that speedily, the luckless surgeon who dares to administer, it may be, chloroform to a weak anæmic patient with a dilated uncompensated heart, or perhaps ether to a plethoric arteriosclerotic with aortic insufficiency. And yet every now and then, in cases of emergency of one sort or another, it falls to the lot of every surgeon to be compelled to administer an anæsthetic to a patient suffering from some serious heart lesion; and one never undertakes such an operation without misgivings.

But that patients exhibiting to a marked degree those conditions supposed theoretically to contraindicate the administration of chloroform will, and do, take it frequently without a single symptom from start to finish—that is, of sufficient gravity to excite a moment's apprehension in the mind of the anæsthetizer—is the common boast of the champions of chloroform. Likewise, the advocates of ether will insist that all classes of patients afflicted with any variety of heart lesion will, as a rule, bear ether well. The weak are stimulated by it, and others —"well," they say, "at any rate, I have never seen it do any harm, and I have given ether to thousands of cases." While the advocates of cocaine will tell you that in the form of Schleich's or other weak dilutions it can be used *ad libitum* in patients afflicted with any form of heart disease without the slightest risk. And so it goes.

It is a waste of time to quote the statistics of Gurlt, von Bardeleben, or the report of the "British Anæsthetics Committee," as to the relative safety of ether and chloroform, to the man who was brought up on chloroform, has never used anything else, and who has been so fortunate as never to have lost a patient therefrom. According to this man, fatalities are always the result of either faulty administration or failure upon the part of the administrator, in case of the appearance of alarming symptoms, to apply proper remedies. "He neglected to suspend the patient, or to induce artificial respiration; to produce traction upon the tongue, or to dilate the sphincter; to give cardiac massage," or what not. And nothing can convince the ether enthusiast that the long list of possible complications and occasional casualties that may and do now and then happen, both during and after ether, are caused either by the improper administration of the drug or by neglect upon the part of the attendants to properly protect the person of the patient from exposure to cold and chilling draughts while under the influence of the anæsthetic.

I have found very few careful and satisfactory observations recorded, showing deleterious effects of anæsthetics in heart disease. A study of the fatal cases is of very little assistance, because it will be found at once that but a very small proportion of these cases were known before-

hand to have had a cardiac lesion, and the absence of organic heart disease has been proven in a large majority of those cases that have come to autopsy.

Ask the surgeon in active practice the question, "How many of your cases with a known heart lesion of greater or less severity have taken an anæsthetic badly or have exhibited alarming symptoms during the course of the anæsthetization?" I feel sure the almost universal answer would be, "Remarkably few." Indeed, the impression made upon my own mind, without reference to statistics, is that heart cases, so-called, bear ether (my experience has been confined almost exclusively to this anæsthetic) very well, and that the comparatively few cases which have exhibited alarming symptoms while under its influence were those with no evident heart lesion. Notwithstanding this wellnigh universal experience, I venture to say, however, that few careful surgeons undertake without misgivings an operation necessitating the use of a general anæsthetic in a patient the subject of organic heart disease.

It is the object of this paper to show, if possible, whether or not this impression existing in the minds of surgeons as to the comparative freedom from accident in patients suffering from heart disease, while under the influence of chloroform or ether, is well grounded; and if so, why? Is it because in cases with a known lesion the anæsthetizer is more careful to watch closely his patient's condition and be on the alert for the appearance of danger signals; in other words, to give that undivided care and attention to the administering of the anæsthetic to which there should never be, in any case, an exception?

It is a well-known fact that the fatalities under chloroform and ether and the bad effects following them occur much more frequently in the hands of the inexperienced or reckless anæsthetist than in those of the expert. And if it is true that heart cases take anæsthetics no worse than normal cases, why should this deep-rooted fear exist in the minds of surgeons as to the danger of giving anæsthetics to such patients?

Let us first note what are the physiological effects of these anæsthetics upon the normal heart. This having been determined upon, are these effects modified by the conditions found present in the different heart lesions?

Anyone who has had wide experience in the administration of anæsthetics must have been struck with the fact that the degree of narcosis and of danger is not indicated by the actual amount of the anæsthetic used, but by the concentration of the vapor inhaled, since one patient may in the course of a long operation inhale a large amount of chloroform without trouble, while another patient may be thrown into a condition of extreme danger by the inhalation of the concentrated vapor of a few drops. Physiologists tell us, and these conclusions have been accepted by most clinicians, that the effect of the two principal general

anæsthetics—chloroform and ether—is practically the same up to a certain point. Their effects, in brief, upon the normal individual are as follows: The pulse, often accelerated before the operation, owing to fright and apprehension, may be still further quickened during the first and second stages of narcosis, although at times it shows some slowing, the effect of reflex stimulation. The deeper the anæsthesia the slower and weaker becomes the pulse; in profound anæsthesia it may be very weak. The tension and rate of the pulse are not so much affected by ether as by chloroform. The margin between a percentage of concentration of chloroform vapor necessary to produce anæsthesia, and one likely to produce dangerous results upon the respiratory centre and heart is much smaller than in the case of ether. This is the chief reason why ether is the safer anæsthetic, and why careless and unskilful anæsthetization is so dangerous.

The respiration is not much altered during the first stage. In the second, owing to excitement, it may become irregular and voluntarily suspended for a longer or shorter time, and then deep and rapid inspirations are frequently observed. This is the most dangerous period. Owing to the possibility of a large amount of concentrated vapor being suddenly inspired, the heart may be so injured as to be unable to carry on the circulation. This is the usual cause of sudden death in the early stages of the administration. Later the respirations become shallower and slower, and occasionally in long operations extremely weak and irregular. The respirations under chloroform, as a rule, are less deep than under ether, and the circulation is thus afforded less aid from the respiration.

The action of these two drugs on the respiratory centre seems to be partly direct and partly indirect. The slowing or temporary arrest of the respiratory movements, sometimes noticed in the first stage of narcosis, are ascribed to a reflex action set up by the irritation of the terminations of the trigeminus in the nose and throat, and of the pneumogastric in the larynx and bronchi. But this is of minor importance, except on account of the following deep inspirations which may lead to the inhalation of a dangerous dose of the anæsthetic if it is pushed at this time. In the third stage direct action of the drug on the respiratory centre is manifested in slow and shallow breathing. If the drug is pushed these effects are increased until finally the respiratory centre becomes paralyzed. And now, although artificial respiration be energetically applied, it often fails, because the heart has become so dilated and the blood pressure so low that the vital centres are so poorly nourished that they can no longer perform their functions, and particularly is this so with chloroform. The effect of chloroform upon the circulation is more rapid and more powerful than ether. They both produce at first a slight rise in blood pressure due to reflex action on the vaso-

motor centre; later, however, a fall in blood pressure is observed with a slowing of the heart's action, and if the anæsthetic be pushed there is a marked fall in blood pressure and the heart stops beating. This result is probably due to either weakness of the heart or paralysis of the vasomotor centre, probably more often the former. Under a moderate degree of chloroform narcosis the heart may become considerably dilated, while under the same grade of ether narcosis it generally remains unimpaired, and rarely becomes dilated until shortly before respiratory paralysis occurs. Fatty degeneration has been noticed in the heart and other organs after chloroform administration, and if marked may lead to heart failure. This degeneration is so slight in ether that it is of no significance.

"Chloroform is from three to four times as depressant as ether to the central nervous system, while its action on the heart is nearly fifty times as great," says Cushny. Ether, since it has to be given in more concentrated vapor, is more irritating to the air-passages, and hypersecretion of mucus, vomiting, etc., are consequently more marked.

As to the actual cause of death, physiologists still differ, but the weight of opinion seems to be that, except in rare instances, respiration fails before the heart. As Cushny has well said, "From a practical point of view it is of comparatively very little importance whether there are a few fluttering beats of the heart after the last inspiration or not. The all-important question is whether the heart has been so injured as to be unable to carry on the circulation, and this is decided by the concentration of the vapor that has been inhaled."

From this it would appear that the most important point in the administration of an anæsthetic, particularly chloroform, is to be sure that the degree of concentration of the vapor inhaled should never reach beyond a certain percentage, say 3 or 4 per cent., while with ether it may be safely carried much higher. It is well to watch the character and rate of the pulse, but of far more importance to watch the respiration for the earliest indications of danger. Bear in mind, then, the action and effects, physiological and pathological, above enumerated, and the uncertainties attending the use of these agents in a normal individual, and then apply them to the various forms of heart lesions met with, and a very ready explanation is at once offered for the deep-rooted prejudice referred to in the beginning of this paper as existing in the minds of surgeons against administering an anæsthetic in certain of the graver forms of heart disease. One can readily understand how in the hands of the skilled anæsthetist a patient suffering from a mild grade of even the severer forms of heart lesion may take the anæsthetic without exhibiting to the slightest degree alarming symptoms. On the other hand, the possibilities for trouble that suggest themselves in the course of the prolonged administration of an anæsthetic in the case of an individual exhibiting signs of a grave heart lesion are truly appal-

ling. No wonder, then, that the careful surgeon shrinks from exposing his patient to such risks until compelled to by the exigencies of the case.

Heart disease does not of itself contraindicate the administration of chloroform or ether, but it would appear that their administration in the presence of certain lesions is attended with greater risks than with others, and that in certain impaired conditions of the heart the one is to be preferred to the other; for instance, in fatty degeneration of the heart, in fact in all pathological myocardial changes, if at all advanced, it is evident that the cardiac and circulatory changes produced by ether might be attended with some risk, but that chloroform, on account of its greater liability to produce fatty degeneration of the heart muscle, would be especially dangerous.

Since the general effect of ether upon the circulation is that of a stimulant, no class of cases seems especially prohibitive, the contraindications to its use being respiratory rather than cardiac. In aortic disease its effect may be apparently beneficial as well as in slight uncompensated mitral affections. I have myself observed recently in a case of aortic insufficiency the murmur all but disappear and the heart's action improve markedly under the stimulation of ether, as I have in one instance at least, observed a mitral systolic disappear completely while under ether, to reappear later after the effects of the anæsthetic had worn off.

It is a cause for wonder that sudden death, relatively so common in heart disease, is not of more frequent occurrence in connection with anæsthesia by whatever agent produced, associated as it is with so many elements calculated to profoundly disturb both the mental and physical equilibrium of the patient, and that this is true, considering to what an enormous number of cases, many of whom are weak and diseased, anæsthetics are being continuously administered, and how few deaths result therefrom, the extraordinary safety of these agents can be the better understood. Cases of sudden death from one cause or another during anæsthesia are, however, to be found scattered here and there through the literature.

Paralysis, arrhythmia, tachycardia, and bradycardia have all been noted as occurring during the course of anæsthesia, due, undoubtedly in some instances, to organic and in others to functional disturbances.

In studying the reports of fatal cases one cannot but feel that in a certain proportion of them at least death was due either directly or indirectly to the violation of some one or more of the cardinal principles underlying the proper administration of an anæsthetic, hence we cannot but emphasize here the especial necessity in all cases of heart lesion of observing the rules formulated from the combined experience, clinical and in the laboratory, of many observers during the half century of anæsthetization.

Brunton has very well said, "A man is not a horse because he happens to be born in a stable, neither is a death necessarily due to an anæsthetic because it happens to occur during anæsthesia." There are certain well recognized causes of death independent of the shock resulting from the effects of the operation itself, such as hemorrhage, injury to nerve structures, etc. Mikulicz has called attention to the great importance of blood examination in anæmic patients before operation in order to determine the percentage of hæmoglobin. It has been shown by this observer and the reports of other later writers that in all patients having a hæmoglobin percentage of 50 or less the anæsthetic may produce dangerous results, shock and collapse being very pronounced. When the hæmoglobin is under 30 per cent. the administration of an anæsthetic is attended with grave risk. An interesting case in point is reported by Bloodgood. Interesting observations, although somewhat conflicting, have been made by J. C. Da Costa, von Lerber, and others as to the effect of the anæsthetic upon the red blood-corpuscles themselves. Deaths from fright at the very beginning, or even actually before the inhalation of the anæsthetic vapor has been begun, have been reported. Anxiety and fear are cardiac depressants and may produce dangerous or even fatal symptoms from heart failure.

I have not the time, nor is this the place, to enumerate and discuss all of the principles referred to, but I will, by way of emphasis, indicate a few of the more important in connection with diseases of the heart. It, of course, goes without saying that the usual preliminary preparation, such as fasting, cathartics, removal of foreign bodies from the mouth, etc., should have been attended to before the anæsthetic is begun. The frame of mind in which the patient approaches the anæsthetic is of great importance, and the anæsthetizer should make it a part of his duty to reassure the patient and gain his confidence as much as possible before actually applying the anæsthetic. I am sure that anyone of any considerable experience must have noticed the quieting effect of a few reassuring words upon a nervous patient. I shall say nothing as to the particular mode of administering the anæsthetic. Each anæsthetizer has his favorite inhaler, and each, as a rule, can do better work with that particular one to which he has become accustomed. For myself I prefer a simple cone.

Laborde, Rosenberg, and others have advocated strongly the preliminary application of solutions of cocaine to the nasopharynx in order to lessen as much as possible the reflex action of the anæsthetic upon the terminal endings of the trigeminus, and thus lessen the danger of sudden cardiac syncope. The claims of these writers, however, seem hardly to be supported by other more recent observers.

In selecting the particular anæsthetic which one shall use, whether chloroform or ether, the majority of operators will be governed more

perhaps by habit and previous training than by any other factor. Still, there are certain conditions which ought to influence the selection of the anæsthetic, for instance, as a rule, in all cases of weak heart, from whatever cause, chloroform is the more dangerous. It is more dangerous, too, in very nervous apprehensive patients, in kidney diseases, etc., while ether in acute lung affections and alcoholics is more dangerous probably than chloroform.

The physical characteristics and temperament of the patient exert no inconsiderable influence upon the way he takes the anæsthetic. The vapor of ether is so irritating to the mucous membranes of some patients, and the secretion of mucus and saliva resulting therefrom so excessive, that there is actual danger of the patient drowning in his own secretions. Short, thick-necked, fat-jawed, florid men, particularly if of alcoholic habits, are notoriously bad subjects for ether.

Among the other dangers to which the patient is subjected one may mention the beginning of the operation, during the stage of incomplete anæsthesia. This danger is more pronounced in chloroform than in ether, because of the additional inhibiting effect of pain upon the heart's action. Complete anæsthesia is indicated particularly in cases of shock.

The two greatest dangers to be guarded against are impeded respiration and the administration of too concentrated vapor. In overcoming the former the effect of the position of the patient, the pressure from tight clothing, arms, assistants, weight of instruments, dropping back of the tongue, mucus and foreign bodies in the throat, etc., must all be considered. The skill and experience of the anæsthetizer is of far more importance in preventing the latter than any special form of inhaler.

That the personal equation of the anæsthetizer plays an important rôle in the effect of the anæsthetic upon the patient is very well illustrated in a case of my own:

A middle-aged man was anæsthetized six times in the course of two years by six different anæsthetizers. The length of time of the anæsthetic and the operative procedures in all cases did not vary much, and his general condition, mental and physical, remained practically unchanged. At the first anæsthetization it took one hundred and twenty grammes of ether and eighteen minutes to produce surgical anæsthesia. From the beginning to the end of administration was one and a half hours. Total amount of anæsthetic used, three hundred and ten grammes. Pulse range, 98 to 122.

At the second operation it took one hundred and twenty grammes and fifteen minutes to anæsthetize. Total amount of ether, three hundred grammes. Pulse range, 90 to 132.

Third, five hundred grammes to anæsthetize and twenty-five minutes to produce surgical anæsthesia. Total, one thousand grammes in one and a half hours. Pulse ranged between 92 and 100.

Fourth, one hundred grammes to anæsthetize in twelve minutes.

Total amount, two hundred and seventy-five grammes in one hour and forty-five minutes. Range of pulse, 85 to 142.

Fifth, one hundred and fifty grammes in fifteen minutes. Total amount, four hundred and fifty grammes in one and a half hours. Pulse range, 90 to 125.

Sixth, two hundred grammes in fifteen minutes to anæsthetize. Total amount, five hundred grammes in one hour and ten minutes. Pulse range, 100 to 160.

When signs of danger appear remedial measures suitable to the indications are to be instituted at once. These vary of course with the nature of the trouble. If respiratory failure, artificial respiration must be begun, and if the trouble has come on early in narcosis, the chances of a successful issue are greater than in the later stages.

Here as elsewhere prevention is far better than cure. I firmly believe that the majority of so-called accidents occurring both during and after anæsthesia, from either chloroform or ether, are entirely preventable; that when they do occur it is due to the carelessness or ignorance of the anæsthetist in not properly watching the effect of the anæsthetic upon his patient—and hence, not being quick to act upon the suggestions offered by the symptoms—rather than to the effect of the anæsthetic alone.

I have undertaken the study of one hundred and forty-two cases of patients suffering from different forms of heart disease, and operated upon for different troubles, minor and grave. Some of the operations were attended with a considerable degree of hemorrhage or shock, others with very little of either. I have endeavored to compare the behavior of these cardiac cases with others operated upon for similar affections under as nearly as possible the same conditions, in order to obtain some idea as to the relative effect of the anæsthetic upon the diseased and normal heart. In the Johns Hopkins Hospital for some years past a regular anæsthesia chart has been kept, showing the record of the pulse-rate at five-minute intervals from the beginning of the anæsthetic to the end of the operation. (A specimen chart is shown on page 134.[1])

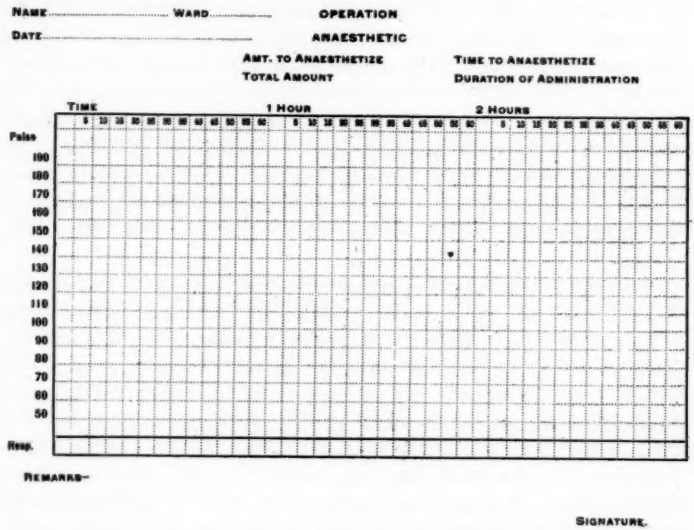
Of the one hundred and forty-two cases, including organic and functional diseases, there were eight cases of myocarditis. To seven of these ether was given; to one, chloroform and ether. Five took ether badly and three took it well. In the case to which chloroform was administered, it had to be discontinued and ether substituted. The bad effects noted from the anæsthetic were rapid, irregular, and weak pulse, cyanosis, and disturbed respiration. One case, an old woman suffering from general septic peritonitis, due to perforation of the bowels from carcinoma, collapsed on the table and died shortly after, but probably shock and sepsis had more to do with the collapse than the anæsthetic.

[1] These anæsthetic charts were introduced by Dr. H. W. Cushing, former Resident Surgeon in the Johns Hopkins Hospital.

There were seven cases of aortic insufficiency. Four were operated upon under ether; in three herniotomy was done under cocaine. All bore the anæsthetic well.

There were six cases of mitral stenosis, four of which took ether, two cocaine, and one chloroform. The operations were all major operations, and all bore their anæsthetic well.

There were two cases of aortic stenosis. In each a complete operation for carcinoma of the breast was performed. Both took their ether exceptionally well, and at the end of the operation little change was to be noted in the condition of either.



There were forty-nine cases of mitral insufficiency, to thirty-eight of whom ether was administered, to nine cocaine, to two chloroform. Five took the ether badly, and five did not take it altogether satisfactorily, although no anxiety was felt during the course of the administration. The nine cocaine cases, consisting chiefly of herniotomies, all did well. The operations in this group were of all sorts. The majority were cases of herniotomy, appendectomy, fistula in ano, hemorrhoids, etc.

There were seven cases of simple hypertrophy, chiefly athletes. Five took the ether well. The sixth, who was operated upon twice, took the ether badly both times. He was a strong, robust young man, apparently in excellent health, but became cyanotic, with rapid and irregular pulse, and a marked ether rigor as soon as he came into the second stage of narcosis. These operations were chiefly for the repair of accidental injuries, or hemorrhoids, and were not severe.

With functional heart murmurs there were forty-six cases, of whom forty-two took ether, two cocaine, and two chloroform. Of these, seven took the anæsthetic badly. In one the trouble was due apparently to an elongated and hypertrophied uvula, the others from no apparent cause.

There were four cases with a basic systolic murmur, the cause of which was not definitely determined. All took ether; one took it badly. This patient was in a very weak and run-down condition.

There were nine cases of arrhythmia, with no other lesion to be made out. All were given ether; all took it well but one in whom the irregularity of the pulse became more accentuated, but not alarmingly so at any time.

Of twelve cases (the whole number of complete excisions of the breast for carcinoma, in whom heart lesions existed), eight cases of mitral insufficiency, two of aortic stenosis, and one each of mitral stenosis and aortic insufficiency, all took ether well. Of twelve control, normal cases of the same operation, selected at random under as nearly as possible the same conditions, all took ether well. Of six herniotomies under infiltration cocaine anæsthesia, but one exhibited any unfavorable symptoms due to the cocaine. Of six control herniotomies, two exhibited symptoms of cocaine-poisoning.

Of thirty-one cases of herniotomy in patients with various forms of heart disease, fifteen of whom were operated upon under ether, twelve under cocaine, one each under chloroform and eucaine, and two under a combination of chloroform and cocaine, all but two bore the anæsthetic well; one case of mitral insufficiency developed a rapid, thready pulse and some cyanosis, which gradually disappeared after the withdrawal of the anæsthetic. The other was a case of strangulated hernia which collapsed under ether and later developed a pneumonia.

Of nine cases in whom the appendix was resected, where a lesion of the heart existed, all took their ether well save one, whose pulse became weak and irregular, and respiration shallow, with some cyanosis.

It is manifestly impossible from so few cases to draw any very definite conclusions. But it would seem from a study of these one hundred and forty-two cases, that in the myocardial affections only do anæsthetics exert any markedly bad effects. In valvular disease their influence is very slight, but yet appreciable. In functional disturbances insignificant.

In conclusion, I cannot emphasize too strongly my conviction that in every operation the anæsthetist plays almost as important and in some cases a more important rôle than the operator, and one of the reforms most urgently needed in the medical practice of our country to-day is a thoroughly competent corps of anæsthetists in our hospitals, and in our medical schools a thorough and complete course of instruction in the proper methods of administration and use of these agents, so power-

ful for good when rightly used, so useful in the relief of suffering humanity, and yet capable of producing such disastrous results.

Subjoined is a partial list of the authors and works consulted in the preparation of this paper.

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CARDIAC ACCIDENTS AFTER ANÆSTHETIZATION.[1]

BY ALFRED STENGEL, M.D.,
PROFESSOR OF CLINICAL MEDICINE, UNIVERSITY OF PENNSYLVANIA.

PERHAPS the least important subject of our discussion to-night is that which for the sake of completeness I have undertaken to consider. Classifying the cardiac diseases as (1) inflammatory affections of the pericardium, myocardium, or endocardium; (2) degenerative diseases of the myocardium; and (3) disturbance of the cardiac innervation, we may simplify the problem by admitting that as far as our present evidence is concerned there is little to warrant the belief that the administration of anæsthetics in the quantities used by surgeons is capable of producing inflammatory disease, excepting, perhaps, of the myocardium.

[1] Read before the College of Physicians of Philadelphia, May 1, 1901.

Chloroform has been believed by pathologists to be capable of causing fatty degenerations of the intima of bloodvessels and of the myocardium, but it must be confessed that the proof of this view is very questionable, and the thousands of chloroformizations without subsequent disease indicate that such a result is at least a very infrequent one.

It must not be forgotten that the anæsthetics, if they have any power to produce inflammatory or degenerative diseases of the heart, have the best possible opportunity for exercising their deleterious influences, because of their absorption through the lungs and their immediate action upon the heart. If they were capable of producing changes in the tissues generally they would be particularly likely to cause such changes in the heart. It would be easy to demonstrate the effects of anæsthetics upon the heart by administering chloroform or ether to animals in the usual way up to the point of deep narcosis and death, and then examining the heart. Every experimentalist must have had opportunity of studying the heart under these conditions, and degenerations and inflammations have not often been found. It is unlikely, therefore, that the anæsthetics have any direct effect of this sort. It is not impossible that a long continued use in small quantities of such substances might effect inflammatory changes of a chronic sort in the endocardium or myocardium, but with such chronic intoxications we have no present concern. It is more likely, however, that the temporary use of anæsthetics might increase an existing myocardial disease or even initiate such; and the possibility of disturbing the nervous mechanism of an already diseased heart in such a way as to cause untoward symptoms is manifestly still more likely.

The difficulty in determining the actual cause of cardiac disturbances that follow operations is so apparent that it needs no discussion. The question must always remain an open one whether the anæsthetic or the shock of the operation was the cause of the cardiac disturbances that have arisen after such operation. The only plans for the solution of this difficulty are to draw our inferences from anæsthetizations not followed by operation, and from anæsthetizations with such trivial operations that the shock could not be regarded as a factor of consequence. The former class of cases is so restricted in number that no very accurate data can be obtained. The latter is a more numerous class.

For several years I have been interested in the study of the cardiac conditions before and after gynecological operations, as my attention had been early called to some unexpected results, and through the interest of Drs. Penrose, Beyea, and Hirst the privilege of examining a considerable series of cases was given me. For the purposes of the present discussion this series is a more useful one than would be a

similar number of cases of operations in general surgery, as many of the operations were comparatively trivial.

I may classify the results obtained under two heads: First, the results in individuals with valvular or myocardial disease; and, second, the results in persons not known to be suffering with any form of cardiac malady.

The former group included quite a number of cases in which a compensated valvular trouble was recognized before etherization, and in which the heart was carefully observed for some days after the operation. In such I have not infrequently found temporary disturbances of action or of compensation of the heart. This has rarely amounted to more than slight irregularity and palpitation, and might perhaps be accounted for by the changed conditions of diet, etc., to which the patient is subjected after gynecological operations. As a rule, these disturbances of action of the heart have come a few days after the operation, and rarely at the time of the most rigid enforcement of dietary abstinence. I assume, therefore, that it is likely that the operation or the anæsthetization was the cause of the disturbance. I have never seen serious loss of compensation.

In cases of pre-existing myocardial disease which had been recognized, ether has been, as a rule, well borne, and I have seen few cases in which the operation had to be cut short or in which restorative measures became urgently necessary. I have had no experience with chloroform, but, as a rule, these patients have seemed to me to show an improved cardiac condition immediately after the etherization and operation, though some days later there has sometimes been a general flagging of vitality and slow falling off in the strength of the pulse, and in two cases that have come under my personal observation marked cardiac disturbances with sudden death when the operative wound and the original surgical condition had practically healed. One cannot, of course, bring any positive proof that so vague and uncertain a thing as failing strength is dependent upon a weakness of any special organ, but I have the belief myself that in cases of weak heart operations or the anæsthetization incident to them sometimes so increase the weakness of the heart that a falling off in general vitality results.

A recent case that came under my observation illustrates the point I am here making.

A gentleman, aged about sixty-five years, with signs of general atheroma with a slight aortic valve disease, met with a serious accident. I saw him some hours later, and found that he was exceedingly weak, though not exactly shocked. His skin was moist and cool, and his pulse weak and irregular. He was etherized, and his injuries were attended with as little delay as possible, and his condition remained about the same during twenty-four hours. Subsequently, he grew weaker by imperceptible steps, and finally died of sheer exhaustion,

without the development of any localized symptoms of any sort. The autopsy showed only fibroid myocarditis and slight aortic valve disease. It seems probable that the nervous shock so disturbed the cardiac action that it flagged increasingly and finally ceased.

Similar cases to this one occur after formal operations. In many of them a terminal pneumonia develops, and this is often ascribed entirely to the etherization or to aspiration of secretions from the throat. While this explanation may be justified in a majority of cases, it does not wholly suffice to account for the conditions met with. A failing circulation renders the base of the lungs more favorable to the development of a hypostatic pneumonia, and the irritation set up by the ether or by aspirated substances acts as the immediate exciting cause.

Another post-operative result to which I wish to call attention is pulmonary embolism. While at first sight this seems in nowise to be connected with cardiac weakness, it is really more or less dependent upon the state of the myocardium. I have seen several examples and discussed the subject in a previous paper. The gynecologists have particularly directed attention to this subject, as the accident in question has occurred after operations for myoma of the uterus more frequently than after any other form of surgical procedure. The embolus which lodges in the lung originates in a thrombus of the pelvic vessels. The sequence of events, therefore, is: thrombus of the pelvic vessels, pulmonary embolism, embolic pneumonia, death. Sometimes this sequence is completed in a surprisingly short time. The rôle played by the heart in this process is that of a predisposing cause, for unless the myocardium is degenerated, as unfortunately it is degenerated in a large proportion of these cases, pelvic thrombosis does not occur after the operation, and embolism is not, therefore, met with.

While the question of degenerations of the cardiac muscle in uterine or other diseases is of no immediate importance in our discussion, I am tempted to refer in this place to some of the published investigations, because they show the importance of proper activity of the heart after operations if certain grave dangers are to be avoided. The fact that such activity is sometimes wanting is due in the first place to the weakened state of the heart, and in the second place to either the operation or the anæsthetization. The cardiac weakness associated with uterine conditions was first described by Schroeder, and later Hofmeyer[1] discussed the same subject; Sänger and Fehling[2] added further observations. The degeneration of the heart found by these observers was most frequently brown atrophy, but occasionally fatty change was recorded. Gessner[3] discusses the subject in detail, and reports seven

[1] Zeit. f. Geb. u. Gyn., Bd. xi. p. 363.

[2] Beit. zur operative Behandlung der Uterus Myome. Stuttgart, 1884.

[3] Festschrift für C. Ruge, p. 165. Ueber Tötliche Lungenembolie bei Gynäkologischen Erkrankungen.

fatal cases after operation for myoma of the uterus, due to embolism of the lung, and in all of which degeneration of the myocardium existed. Among others he quotes observations of Mahler,[1] who reported six instances with degeneration of the heart, thrombosis, and embolism.

Whether the operation or the etherization is the cause of the disturbance of heart action in these cases is, as I said in the beginning, an open question, impossible of solution at the present time. My own feeling regarding the matter is that etherization should be suspected of playing some part in weakening a previously diseased heart; and I would base this upon my experience in two other cases in which no pelvic thrombosis had taken place, in which there was no cerebral or pulmonary embolism, and in which the fatal termination was more or less unexplained, though the heart seemed from the clinical symptoms, as well as from the post-mortem examinations, to be the organ properly under suspicion. The first case was operated upon by Dr. Baldy for a repair of the cervix. I did not see the patient during life, and was not present at the autopsy, but saw the heart soon after the autopsy. The other organs were reported entirely normal, and at first sight the heart appeared equally so, but its substance seemed friable and resembled in its appearance the condition of the myocardium found in protracted fevers. Unfortunately, microscopical examinations were not made. The second case was one in which ventrosuspension was performed by a skilful operator, and the patient remained in good condition for two days, showing no unfavorable symptoms of any sort. On the third day after the operation the pulse suddenly increased in rapidity, the temperature rose, and in twelve hours the patient died. At the autopsy no abnormality was found in any of the organs excepting the heart, which presented a rather congested appearance, and which, on microscopical examination of a number of portions, examined somewhat after the manner of the serial sections of Romberg, showed intense congestion of the interfascicular capillaries and some acute myocarditis. There was no discoverable cause for this condition of things, and it seemed to me at the time, and has seemed to me ever since, that it was probably the result of etherization.

I am well aware that no positive conclusions are to be drawn from a discussion which has necessarily included many statements of opinion rather than of actually ascertained facts. I think, however, that the following statements may be tentatively made.

1. In all cases of cardiac disturbances after operations it is difficult to determine whether the result was due to the anæsthetic or to the operation.

[1] Thrombose, Lungenembolie und plötzlicher Tod bei Geburtshülfe und Gynäkologie. Arbeiten a. d. Kgl. Frauenklinik in Dresden. Leipzig, 1895, Bd. ii. p. 72.

2. In many cases of recognized cardiac disease the administration of ether has a temporarily beneficial effect upon the cardiac condition. It is not improbable, however, that in some of these the secondary effect is an unfavorable one, the symptoms occurring after a lapse of some days.

3. It is important to recognize that certain results following operations, such as basal pneumonia, gastroduodenal disturbances, and especially embolism, are in reality the results of a weakened state of the heart, and that they may, therefore, owe their development to the anæsthetization or to the shock of the operation.

4. The untoward effects of anæsthetics are, I believe, due to the disturbance of the nervous mechanism or the essential muscular automaticity rather than to organic changes in the myocardium, endocardium, or pericardium.

PRE-EXISTING HEART DISEASE IN REFERENCE TO SURGICAL OPERATIONS.

By William J. Mayo, A.M., M.D.,
SURGEON TO ST. MARY'S HOSPITAL, OF ROCHESTER, MINNESOTA.

The demands of modern life tax the energies of the individual to the utmost. A sound heart in a sound body acquires a new significance, for the stress falls to a large extent upon the circulation. Clinical observers of wide experience believe that diseases of the heart are on the increase, not the mechanical lesions which we so long considered the chief source of cardiac disability, but failure of the heart muscle through disease.

We have, heretofore, measured the heart power by the size of the obstacle to be overcome, but in reality more depends upon the perfection of the cardiac contraction and its ability to overcome resistance. The normal heart has a vast reserve power. The sound muscle fibre quickly recuperates from overwork, and the circulation but momentarily fails. This is not true of the compensating heart. Hypertrophy is a conservative process, but it does not begin at the exact moment the circulation is obstructed, but at a time when at least a portion of the reserve has been expended. Compensation in itself presupposes a lessened reserve force. The more exactly the compensation balances the obstruction the less the liability of cardiac failure under temporary stress. To the surgeon the condition of the cardiac muscle is of prime importance. A crippled heart may compensate for the ordinary affairs of life, but the question is, has it sufficient reserve force to carry on its function during an operation, which, though temporary in character,

is attended by an increased call upon the heart's strength? The dangers to be feared are very real, and do not lie entirely in the anæsthetic. The necessary injury to the nerves and other tissues of the body with the loss of blood must be taken into account, and the amount of this operative traumatism cannot always be foretold with certainty.

The circulation demands that the arteries be kept overfull; the heart must be equal to keeping the pressure in the arteries greater than in the veins, and premonitory symptoms of a failing compensation must be earnestly sought before an operation is undertaken in the face of cardiac disease. The reserve power of the normal heart is not as great in infancy and old age, although the writer has not found this to be as true of the latter as the former period of life. Very fleshy people have less reserve force, and from an operative stand-point are generally looked upon with suspicion. People of unusual height are also supposed to have relatively less cardiac reserve. Our experience in the Northwest with people above the average height has been considerable, and we have found them, as a rule, most excellent subjects for operation.

The enervation of the heart plays an important part in estimating an operative risk. It must, at least, be sufficient to enable the reserve force to be called into play. His demonstrated that the power of contraction lies in the muscle fibre of the heart itself, and exists before the cardiac plexus is formed. The vagus and sympathetic are integral factors in the cardiac ganglia, and disturbance of function resulting in excessive rapidity or slowness of the cardiac pulsations may often be traced to reflex conditions acting through the nerve-supply or be a personal or family idiosyncrasy. An irregular or intermittent pulse may also result from the abuse of tea, coffee, or tobacco. The cause in any event should be determined, and the probable influence upon the patient's ability to withstand an operation estimated.

Heart lesions may properly be divided into two general classes: First, valvular and endocardial disease; second, myocardial changes. The sharp distinctions between them have, however, passed away with the advent of better knowledge of the subject. Myocardial changes are often found associated with valvular disease, particularly so when compensation begins to fail, while in the latter stages of myocarditis secondary valvular lesions are common.

Between the ages of ten and forty valvular disease is usually well compensated, and if the heart's action is easy and the circulation well carried out the operative risk is not great, and in our experience we have never lost a patient from this cause. There is but little liability of overlooking the condition, the early development of characteristic murmurs and the ease with which the hypertrophy can be recognized enables the surgeon to gauge the disability with a fair degree of accuracy. The operation is undertaken with full knowledge of the

cardiac disability and its character, and the choice of an anæsthetic is greatly influenced by this condition. If there is failing compensation and signs of marked dilatation only operations of the greatest urgency would be undertaken without preparatory treatment. It is fortunate that valvular lesions are the most common during the active period of life, at which time the large majority of operations becomes necessary. After forty, valvular lesions are usually associated with some degree of myocarditis.

I do not wish to be understood as minimizing the importance of primary valvular lesions, but rather to point out that the ease of diagnosis and the fair degree of accuracy with which the compensation can be estimated does not render it a frequent cause of operative mortality. The knowledge of the cardiac insufficiency robs it of much of its danger.

Myocarditis is the condition which the surgeon has reason to fear. There are often no sign-posts of danger, and the first intimation of trouble is the sudden death of the patient upon the operating table or shortly afterward. It may happen that the operation was performed for the relief of some condition which in itself was not serious, and which would not have been undertaken if knowledge of the heart disability had been previously obtained.

That a heart which is not increased in quantity as estimated by the usual means of diagnosis and the quality of its action seemingly unimpaired should suddenly fail when called upon for a temporary reserve force, is an appalling fact, but nevertheless true. Fortunately, the large majority of cases do give signs and symptoms which if looked for with care will enable the surgeon to detect the possibility of disease, and in the later stages the diagnosis may be self-evident. Cardiac symptoms after middle life not plainly pointing to valvular lesions are probably myocardial in origin. Preble quotes the following on myocardial disease from Huchard: "Their evolution is latent, their beginnings insidious, their course paroxysmal, their progress interrupted. They are complicated by a variety of visceral manifestations, and are brutally sudden in their explosions of cardiac insufficiency."

Acute myocarditis results from various infections and may date its origin to an attack of diphtheria, gonorrhœa, quinsy, influenza, or other infectious disease. If death occurs primarily there may be no macroscopical evidence of disease of the heart, the changes are microscopical (Stengel). Acute myocarditis usually passes into the chronic form, but the large majority of cases of chronic myocarditis are so from their inception. The disease is marked by the development of fibrous tissue, and other nutritive changes brought about through lesions of the coronary arteries. Rosenbach believes the fibrosis to be a conservative process and that it braces up a feeble muscular power. Freer, on the

contrary, maintains that it is primarily a destructive one, and analogous to fibrosis of the kidney.

Fatty degeneration of the heart, according to Strümpell, Van Leyden and others, seldom gives signs of its presence excepting in the later stages. In experimental fatty degeneration produced by Hasenfeld and Fennyvessy, there was no change in the cardiac size nor was the rhythm or force of the pulse affected. Stokes considered pseudo-apoplexy, soft blowing systolic murmurs with a slow pulse, pathognomonic of fatty degeneration, but as myocarditis was but little understood in his day it was only the cases in which this condition was more marked than the fibroid changes which were recognized. Fatty degeneration is often an accompaniment of myocarditis or one of its results, and the great loss of reserve force which it produces, together with the difficulty of even an approximate diagnosis, makes it the most serious disease of the heart from a surgical stand-point.

Lesions of the aortic opening and valves appearing about middle life can also be classed with myocarditis, and are often associated with it. Changes in the coronary vessels and at the base of the aorta usually coexist. This form of valvular disease has what may be called a physiological basis, and is more serious than similar lesions at the aortic opening in the young. Benike, by a series of measurements, has shown that after forty the aortic opening gradually increased in size, and it is easy to understand how severe work or disease might lead to grave consequences. Myocardial changes, associated with arteriosclerosis and contracted kidney, must also be taken into account.

The writer does not wish to discuss the symptomatology nor pathology of myocarditis, but merely to call attention to the diminished reserve force of the heart which it entails, and point out that many of the unexpected and sudden deaths which take place at or soon after an operation are due to this cause. A patient in middle or later life showing signs of progressive cardiac weakness manifested by a vigorous heart contraction with a feeble pulse, irregular in rhythm and associated with cardiac pain and attacks of dyspnœa with general loss of strength, is to be looked upon with suspicion, and an operation is not to be slightly undertaken. The more advanced cases of myocardial disease present such characteristic symptoms that only life-saving procedures would be indicated. Illustrating the operative mortality, the two following cases are briefly reported.

Case I. *Cholecystotomy in patient with chronic myocarditis; sudden death forty-eight hours after operation.*—Mrs. J. D., aged thirty-five years, American. First came under observation in September, 1900, with a history of gallstone disease. On examination the heart's action was found to be 120, pulse feeble and intermittent, a faint mitral murmur could be detected. There was slight increase in size. Patient com-

plained of attacks of dyspnœa and oppression in the chest, and at times slight vertigo. No direct history as to the origin of the cardiac lesion. The attacks of colic were frequent and very distressing. Patient pale and anæmic. In the face of grave myocardial disease operation was not advised at this time. On January 5, 1901, she was readmitted to St. Mary's Hospital; the heart's action was very much improved, pulse 112, fairly good quality. Patient's physical condition better, but the attacks of gallstone colic were frequent and some jaundice had followed the last attack. On January 8th cholecystotomy was performed. The operation was easy and quick. There were no complications. Anæsthesia, nitrous oxide, and ether. Time, twenty minutes. Patient was in excellent condition for forty-eight hours, when she suddenly died from cardiac failure without premonitory symptoms.

Case II. *Abdominal hysterectomy for malignant disease in patient with chronic myocarditis; death on operating table from chloroform anæsthesia.* —Mrs. E. E., aged forty-eight years, German. Admitted to St. Mary's Hospital on January 10, 1901. This patient came under observation four years ago with an ovarian tumor, and at that time had physical evidences of myocarditis. The tumor was removed under ether anæsthesia. She had remained in fair health except for occasional attacks of dyspnœa, palpitation, and a chronic cough. She returns now for the relief of malignant disease of the body of the uterus. On the day following admission the patient developed influenza and bronchial pneumonia, and over two weeks elapsed before she was in a condition for operation. The heart's action was forcible, the pulse full, intermittent, and 120 to the minute. There was marked hypertrophy and a mitral murmur, with evidence of chronic myocarditis. On January 26th abdominal hysterectomy was undertaken under chloroform anæsthesia. This anæsthetic was chosen on account of the bronchitis which had been much aggravated by recent illness. The patient took the anæsthetic badly, and was given but little. The operation had proceeded about ten minutes, when the heart's action and respiration suddenly stopped and the patient could not be resuscitated.

Heart lesions secondary to the disease for which the operation is undertaken may be either valvular or myocardial, usually the latter. The most common are due to obstructed circulation by the pressure of large tumors, especially uterine myofibromata. Hofmeier collected eighteen cases in which sudden death occurred from this cause. Williams, of Bristol, in eight fatal cases unoperated, states that two died from heart disease. Pean met with four severe cases in twenty-four.

There is at first compensatory hypertrophy, later secondary dilatation and degeneration of the heart muscle usually associated with valvular disease. Sibileau, in seventeen cases of this character, notes that the lesions are usually mitral. The dangers to be apprehended are not only at the time of operation, but later from embolus. We have met with five of these cases, all of them associated with large myomata, and in which no history of cardiac disease preceded the development of the tumor. In two the lesions previous to operation were exceptionally severe, and it seemed questionable whether an operation was justi-

fiable. The convalescence of our patients after hysterectomy was uninterrupted, and three of the cases I was able to examine as to the cardiac condition after the lapse of a year or more. The improvement was most marked, the size of the heart greatly diminished, and the valvular lesions could only be detected by the most careful examination.

Without going into the mooted question as to the nature of exophthalmic goitre, it may be stated that at least some cases result in myocarditis or fatty degeneration of the heart, and perhaps this has been one of the causes of sudden death which follow thyroidectomy. In seven thyroidectomies for Graves' disease we had one death from this cause. The history of the case is briefly as follows:

CASE III. *Thyroidectomy for exophthalmic goitre in patient with myocardial disease; operation performed with local anæsthetic; death in twenty-four hours from cardiac asthenia.*—Miss K. S., aged twenty-seven years, American, occupation, house-work. Admitted to St. Mary's Hospital in May, 1899, with a history of exophthalmic goitre which had appeared a year previously. The severity of the symptoms was gradually increasing. The immediate cause of admission was an ovarian cystoma the size of a fourth month pregnancy. During the period of observation the pulse was constantly above 130, no direct evidence of cardiac lesion. The tumor was removed under chloroform anæsthesia. Recovery uninterrupted, and she was discharged in three weeks. Readmitted August 29, 1900. The phenomena attending Graves' disease had markedly increased, pulse weak, and constantly above 140, and on exertion 160 or more. There was a faint murmur to be detected at the apex of the heart, evidently mitral in origin. The heart was somewhat enlarged and forcible in action. Attacks of dyspnœa were frequent, and the patient very anæmic and emaciated. On September 1st the right lobe and isthmus of the thyroid gland were removed under local anæsthesia with cocaine. The operation was not attended by any untoward accidents. The pulse became exceedingly rapid after the operation and a mild delirium supervened. Twenty-four hours later the patient died from cardiac asthenia.

It will be noted that in the three fatal cases reported one died suddenly forty-eight hours after an easy operation apparently well borne. The second died from the anæsthetic on the operating table and the third twenty-four hours after an operation under local anæsthesia. In going over the records of the cases operated upon in the hospital with which I am connected over 1 per cent. have had some form of heart lesion existing before the operation.

THE SAFEST ANÆSTHETIC TO USE IN ORGANIC DISEASES OF THE HEART AND VESSELS.

By H. A. Hare, M.D.,
PROFESSOR OF THERAPEUTICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

It is a remarkable fact that very few people even with grave cardiac and vascular disease die as a direct effect of the anæsthetic. If statistics were looked into it would be found that very few people die from the effect of the anæsthetic in the presence of cardiac disease. A larger number of people die at stool or on going up stairs when suffering from disease of the heart than from the effects of anæsthesia. It will be found that the anæsthetics when skilfully administered usually exercise what might be called a beneficent rather than an evil influence. I am strongly convinced that in the majority of instances when accidents occur during the administration of an anæsthetic the anæsthetic is not to blame for the fatal result, but rather the shock of the operation. My reason for this belief is that I have had some experience in administering anæsthetics to patients suffering from grave cardiac diseases. I have always approached such cases with the feeling that the danger was very great, and I have again and again seen the patient's condition improve under the anæsthetic, so that in fifteen or twenty minutes after the use of the anæsthetic was begun the condition of the patient has been better than before it was employed.

Another point of great interest is the question of the reserve power of the heart in valvular disease, in which there is compensatory hypertrophy. Usually this is not taken into consideration. In healthy cases there is so much energy used by the heart, and there is so much reserve power. In disease we have very little reserve. As a result, as soon as the shock occurs the diseased heart cannot with the small amount of reserve force meet the conditions which are present.

Another point to be considered before taking up the various forms of anæsthetics is the question of poisoning by these drugs. I venture to say that not one surgeon in a hundred has any conception of the quantity of anæsthetic which his patient receives. Careful histories of the operations may show that so many drachms of chloroform or so many ounces of ether were employed, but this gives no information at all to one who really wishes to know how much anæsthetic the patient has received. Some of the anæsthetic goes into the air, and some into the lungs. The possibility of the patient being poisoned because the dosage is unknown or is not estimated is a very important one. Lawrie, in the consideration of this subject, has deserved much credit. He has taken the point that it is not the dose which is poured on to

the inhaler, but the dose which is taken into the lungs which should be watched. He has pointed out that in the presence of irregular breathing (in chloroformization this should be the sign for ceasing the anæsthetic until the respirations become regular) there is great danger of an overdose being taken. As soon as the patient takes deep respirations it is impossible for the anæsthetizer to have any gauge of the quantity of the drug absorbed. When a man fills his lungs with a deep breath of ether a large dose is taken, and the next instant on making a superficial inspiration but a small dose is absorbed.

Another interesting point is in choosing particular anæsthetics. Many men do not look into the individual idiosyncrasies and peculiarities of their patients. Dr. Mayo has stated that persons over the usual height are supposed to be the ones who do not take anæsthetics well, and that this is not his experience. I cannot help being impressed with the fact that most of his patients, while probably over height, nevertheless came of exceedingly strong and powerful stock. For a good many years I was near Minnesota, and found that nearly all these large and powerful people are descendants from the Norsemen and the Swedes. The amount of their vitality is extraordinary. They submit to surgical operations and to serious traumatism with apparent impunity. They sustain dreadful injuries in threshing machines, and go through attacks of typhoid fever and other infectious diseases with extraordinary ease. I think the slight ill effects of the anæsthetics in persons over height in Mayo's experience is unusual, and is not of value in influencing our opinion that persons of great height bear these drugs badly. In this part of the country it is correct; in that part of the country it may be incorrect.

Another point which is overlooked by the clinician and surgeon before operation is the examination of the cardiovascular conditions. In many instances where there is high arterial tension the administration of ether is contraindicated. Ether increases the arterial tension and stimulates greatly the cardiovascular system. So I doubt whether in high tension of the cardiovascular system it is wise to administer ether, though I believe it is as a rule the safest anæsthetic. In regard to the condition of the bloodvessels, I believe American physicians do not employ atropine often enough in the stimulation of the vasomotor system. I have given it frequently in cases and in experiments upon animals. It checks the excessive secretion in the upper air passages and prevents the tendency to œdema of the lungs. Where the respiration is difficult from apparent œdema or diffuse capillary bronchitis it causes a disappearance of the disturbances in breathing which is little less than extraordinary.

The choice of the method by which the anæsthetic is to be administered is more important than the anæsthetic. Several of the surgeons,

whom I have considered the greatest, have anæsthetics administered in a way which I think disadvantageous to the patient. They have resorted to a form of apparatus, sometimes connected with an oxygen cylinder, which fits over the nose quite closely. With this is connected a large flat rubber bag. Into this bag the patient expires and inflates it, then inspires and deflates it. He inhales with the anæsthetic a large amount of effete air and carbonic acid gas. It is surely much better to have him exhale into the surrounding air. It has been explained to me by one or two operators that in this way the patient gets more of the anæsthetic and less atmospheric air. I think the patient should be given an amount of oxygen over and above the atmospheric air.

The habit of many of having the oxygen carried to the patient through the anæsthetic has a great many disadvantages. It is probable that the oxygen is capable of producing chemical changes in the drug. When chloroform or ether is used it is impossible to increase the oxygen without increasing the quantity of the anæsthetic, and it is impossible to increase the anæsthetic without increasing the oxygen.

If the oxygen is passed from the oxygen cylinder through a water bottle to the patient's nostril the anæsthetic can be given in accurate dose, and also the oxygen.

In regard to the best anæsthetics, I believe that ether is by far the safest if properly administered, except in vascular disease. It is usually contraindicated in grave vascular disease, in atheromatous conditions, in high arterial tension due to vascular changes. I do not think ether is strongly contraindicated in Bright's disease if it is impressed upon the anæsthetizer that the kidneys are affected and that the ether is to be given with the necessary precautions.

I am much interested to learn from Dr. Finney that Dr. Kelly, who at one time was most enthusiastic in the use of chloroform, has given up its use, because Dr. Kelly told me that he expected to employ chloroform always; that he had found it extremely satisfactory in that it saved time, and he had never had a serious accident.

The use of chloroform in the presence of myocardial change is very dangerous. As Dr. Jacobi has pointed out, it is wrong to suppose that myocardial change is a universal degeneration. Small degenerated patches may be present, and so be overlooked, with fatal results.

Nitrous oxide I believe is very strongly contraindicated in vascular degeneration. I have seen two cases of fatal apoplexy after the administration of the nitrous oxide, principally due to the resulting asphyxia.

In regard to the effect of anæsthetics in the presence of valvular and myocardial disease, particularly in valvular disease, I have seen such patients improve by the administration of an anæsthetic. I have taught that in the presence of circulatory disturbances the chances of the patient are better with an anæsthetic than without it. This view has been

proved to be correct by the few cases in which I have seen an attempt to employ the various forms of local anæsthesia in the place of general anæsthesia in the presence of valvular disease. I have seen more than one such case in which the shock was so great that the patient's condition was made infinitely worse, and in which the condition improved as soon as the local anæsthetic was discarded and general anæsthesia was employed. One case seen through the kindness of Dr. Keen especially illustrated this. First, spinal anæsthesia was used, then local anæsthesia, and, finally, ether and oxygen. The changes in the condition of the patient formed one of the most interesting things seen in medicine. The woman, pale, lead-color, with pulse almost absent at the wrist, apparently in a desperate strait, under the influence of ether and oxygen instantly revived. The skin, which a few minutes before was livid and lead-gray, showed the restoration of the capillary circulation, so that she went through the whole operation in a successful manner. It is true that after the operation she had grave circulatory disturbance with some tendency to œdema of the lungs. This, I think, was due more to the shock of the operation than to the administration of ether.

In conclusion, I might say from my own observation of intraspinal injection as an anæsthetic that it will soon be regarded as a medical curiosity. I believe it has not the wide scope of usefulness with which it was heralded, and that in a short time it will be relegated to the same obscurity as Bourgeon's method for the cure of phthisis by the injection of hydrogen sulphide and carbonic acid gas into the rectum.

SOME CONDITIONS OTHER THAN AORTIC ANEURISM WHICH DETERMINE THE OCCURRENCE OF THE TRACHEAL TUG.[1]

By Henry Sewall, Ph.D., M.D.,
of Denver, Colorado.

Since the brief note of Oliver,[2] in 1878, announcing the occurrence of the tracheal tug in aneurism of the aorta and the method for detecting it, the value of the phenomenon as a diagnostic sign has been somewhat in dispute. Macdonnell,[3] using a large clinical experience, committed himself to the statement that "tracheal tugging is never present except in aneurism." Ewart,[4] Toulmin[5] and others have found on systematic examination of persons not the subject of aneurism that a more or less pronounced tracheal tug is present in a large proportion

[1] Read by title at the meeting of the Association of American Physicians, May, 1901.
[2] Lancet, 1878, vol. ii. p. 406.
[3] Ibid., 1891, vol. i. p. 535.
[4] British Med. Journ., 1892, vol. i. p. 596.
[5] Journ. Amer. Med. Association, 1897, vol. xxix. p. 4.

of cases, and Ewart found it more common in males than in females. Auerbach[1] and others have shown that the presence of tumors in certain situations about the aortic arch can cause the tug, and Norris[2] has recently reported a case in which the sign was prominent without post-mortem examination revealing physical conditions explaining it.

The excuse for the present paper is, first, that the deductions here presented are based on a much greater number of cases than seem to have hitherto been applied to the subject; second, I venture to believe that a satisfactory explanation of the tracheal phenomenon both in physiological and in most pathological conditions has been demonstrated.

My attention was first definitely directed to the tracheal tug as a diagnostic sign in the case of a gentleman who, for four or five years preceding his death, at the age of sixty, had suffered from a purulent bronchitis, in the abundant expectoration of which tubercle bacilli could only be demonstrated during the last year of life. This patient was racked by paroxysms of a loud, rather ringing cough; the aortic heart sound was much accentuated; the pulmonary signs seemed to indicate pressure by an intrathoracic mass, and during the last year or more of life there developed a very distinct tracheal tug. A tentative diagnosis was made of intrathoracic tumor, malignant (in former years a supposed sarcoma had been removed from the breast), glandular, or aneurismal, complicating tuberculosis. At the autopsy no tumor was found. The lungs were voluminous and contained rather few scattered tubercles, but there was striking thickening and stiffening of the bronchioles and pulmonary bloodvessels, with massive induration of the root of the left lung. Microscopical preparations of the lung, made under the direction of Dr. J. A. Wilder, showed beginning fibrosis of an extraordinary degree. In addition, the left pleura was throughout closely adherent to the chest wall.

On reflection there developed a simple and interesting explanation of the occurrence of the tracheal tug as dependent on the anatomical conditions discovered at the autopsy. When the aorta, looped over the left bronchus, presses upon the air tube sufficiently to transmit to it a pulsation, the downward stroke of the pulsating artery is expended both upon the trachea and on the upper lobe of the left lung. The lung tissue is normally of such extreme extensibility, and its surface glides so readily on the thoracic wall, that any ordinary impulse transmitted by the aorta to the bronchus stretches the lung tissue rather than pulls down the relatively fixed trachea. On the other hand, when the left lung is anchored to the chest wall, as it were, by close

[1] Abstract in AMERICAN JOURNAL OF THE MEDICAL SCIENCES, March, 1901, p. 340.
[2] American Medicine, March 20, 1901, p. 108.

pleural adhesions, and when in addition the normal extensibility of the pulmonary tissues is diminished by infiltration or fibrosis, the pulse of the aorta must be registered in movements of the trachea to an increased amount compensating for the lessened mobility of the lung. Moreover, just as the lever of the sphygmograph performs wider excursions as the pressure of its spring on the artery is increased up to a certain point, so we should suspect systolic downward pulsation of the trachea to manifest itself especially under physiological conditions in which the approximation of the aorta to the bronchus where it crosses the latter is closest.

In order to test the validity of this reasoning, I have during the past year examined 430 persons as to the possession of a tracheal tug. No selection whatever was made as to the kind of cases studied. They included normal individuals as well as subjects of diseases other than known aortic aneurism. In each case the personal history was ascertained, and in nearly all a physical examination of the chest was made. Though it would be desirable to have a far greater number of cases on which to base conclusions, I have to express grateful appreciation for assistance afforded me by many colleagues and friends. Very slight experience made it evident that a downward pulsation of the larynx immediately following systole of the ventricles is an extremely common phenomenon. These laryngeal movements form, as regards their amplitude, a continuous series varying from a just perceptible impulse transmitted to the fingers of the observer at the end of inspiration, to a strong downward twitch of the larynx approaching in vigor the tracheal tug in an appropriate case of aneurism. I have never seen in any of my subjects so marked a tug as that developed in some examples of aortic aneurism. But every aneurism and its signs must have a beginning, and the diagnostic importance of the tracheal tug should depend largely for its specific value on being manifest when the other signs of aneurism have not yet reached their full development. Many observers must have been struck with the gradual disappearance of the tracheal tug in cases of aneurism in which, by one means or another, aneurismal pulsation has been diminished by deposit of fibrin. The suspicion, of course, suggests itself that at least the slighter impulses here described are nothing more than the shocks of carotid pulsation transmitted to the larynx. In answer to this it may be said that the impulse or twitch can only be felt when the fingers are applied to the larynx in such a way as to detect a downward jerk ; it is not observed on simply touching the front or sides of the cartilages. To obtain the tug the procedure originally proposed by Oliver cannot be improved upon. The patient should be seated with the head well thrown back. This position elevates the larynx and puts the trachea on the stretch, so that downward impacts are less likely to be lost. The observer,

standing behind the patient, places the tips of either his forefingers or middle fingers under the rim of the subject's cricoid cartilage and presses gently upward. Sometimes only the thyroid cartilage can be satisfactorily grasped. Under these conditions the whole larynx is felt to make an inspiratory excursion downward with a return upward in expiration, and a more or less evident tug may be sometimes felt, usually, but not always, confined to the phase of inspiration. The downward, respiratory movement of the larynx becomes very marked with deep inspiration, and when the chest is fixed in this phase of respiration the larynx tends to become rigidly fixed in its lowest position. The downward movement of the larynx is said to be due to the inspiratory contraction of the sternothyroid and sternohyoid muscles. The extraordinary prominence of this movement in conditions of dyspnœa and its frequent lethal significance in disease seems to be out of proportion to the benefits that can be ascribed to the movement. Although the non-aneurismal tracheal tug tends to be confined to the phase of inspiration, the downward movement of the larynx in this condition, and, in fact, any fixation of the larynx by its extrinsic muscles, evidently must interfere with the mechanical conditions permitting the transmission of the movement of the trachea to the larynx. It has frequently occurred in the course of my observations, particularly with subjects of nervous disposition, that a laryngeal twitch which was prominent at the beginning of an experiment completely disappeared when the patient's attention was directed to the respiratory movements. This anomaly was for a time attributed to possible variation in the amplitude of the aortic pulse, as apparently Ewart[1] would explain it, or even to change in the elasticity of the pulmonary parenchyma, such as West[2] has suspected may arise from contraction of its intrinsic muscle fibres. Finally, however, the simpler and more satisfactory explanation was hit upon that the failure of the larynx to transmit the pulsatile movements of the trachea is due to such depression of the former organ through its sternal muscles as to relax the membrane connecting the rim of the cricoid with the trachea.

The general results of my observations are thrown together in a table at the end of this paper, but they may be made clearer by the following statements: In the table the results of the examinations as to the presence or absence of the signs of tracheal tug are classified in the vertical columns according to the prominence of the sign. In the column headed "none" are placed the cases manifesting no pulsatile tracheal movement. In the column "slight" are cases in which only a slight pulsatile twitch was felt. In the column "d" the tracheal twitch was distinct, and the distinctness of the sign was more and more

[1] Loc. cit.

[2] Allbutt's System of Medicine, vol. v. p. 338.

pronounced in the cases in the succeeding columns until in d''' the prominence of the tug might well lead to the suspicion of the existence of a developing aneurism of the transverse portion of the aortic arch. It may be remarked that in my list three cases, in which there could be no fair suspicion of aortic aneurism, exhibited a slight "diastolic shock" which Hall[1] believes to be pathognomonic of aneurisms of the aorta. My subjects varied in age from three years to eighty-five years. The youngest person manifesting a tracheal tug was sixteen years old. The tracheal sign was found relatively most frequently in persons between twenty and fifty years old, the age of greatest frequency being somewhat more advanced in cases having pulmonary disease. Of the 430 cases, 245 were males and 185 were females. The sexes are kept separate in the table, for reasons which will appear later. In order to test the efficiency of the conditions previously discussed to produce a tracheal tug, all cases were divided into three groups. I. Normal individuals, or those in which there was no evidence of left-sided pleural adhesions or pulmonary fibrosis. II. Cases manifesting the signs of tuberculosis at the left apex or giving distinct history of the disorder; also cases which had suffered pleurisy or pneumonia on the left side. III. Cases of marked atheroma or emphysema, including chiefly persons advanced in years. The cases were also grouped according to age.

It is assumed that cases in Class I. had lung tissue of normal elasticity and were without pleural adhesions; that in the members of Class II. there were probably pleural adhesions on the left side, as well as diminished extensibility of pulmonary tissue; in Class III. the extensibility alone of the lung tissue was assumed to be affected.

Of the 245 males examined, 113 are recorded as normal as regards their pulmonary condition. Of these 61 manifested no tracheal twitch, and 52, or 46 per cent., of the 113 exhibited a twitch. No less than 37, or + 32 per cent., of the 113 exhibited a very evident tracheal tug of varying degrees of distinctness. Of 112 males showing evidence of pulmonary lesions probably causing adhesions of the left pleura, only 17 were without signs of the tug, while 95, or 84 per cent., possessed it, and 71, or + 63 per cent., of the 112 showed a very prominent tug.

A striking exception to the occurrence of the tracheal phenomenon in pulmonary disease was found in some tubercular cases in which extensive excavation occupied the site of the left upper lobe of the lungs. This apparent anomaly rather supports the position here assumed as to the conditions determining the transmission of the tug, for when a large mass of pulmonary tissue is absent the bronchus distributed to it cannot be supposed to be fixed on the side of the lung. Also, it is

[1] AMERICAN JOURNAL OF THE MEDICAL SCIENCES, January, 1900.

worth observing that in two cases of left-sided pneumothorax (accompanying tuberculosis) there was no tug whatever. Of the male cases of the third class, those showing signs leading to a suspicion of greatly diminished extensibility of the pulmonary tissue, there were twenty examples. Of these 10, or 50 per cent., showed a tug, a proportion differing little from that found in normal cases; but of the 10 cases, in 6, or 30 per cent., the tug was of a decided character.

A comparative study of the 185 female cases leads to interesting conclusions. In 125 normal persons 99 were found without tracheal twitch, and 30, or + 23 per cent., with it. Of the latter only 10, or less than 10 per cent. of the whole, showed anything like a distinct tracheal tug. On the other hand, of 47 female cases with probable left pleural adhesions, 34, or + 72 per cent., manifested pulsatile tracheal movement, which in 20 cases, or + 42 per cent of the 47, was marked in character. In the third class of females there were but 9 cases showing a tug in 4, or 44 per cent.

The conclusion is manifest that *a tracheal tug quite palpable in character is, in the majority of cases, associated with and dependent upon adhesions of the left pleura. Diminished extensibility of the lung tends to produce the same phenomenon, and the tug is most pronounced when the conditions are combined.*

It still remains to explain why perfectly normal subjects so often exhibit a distinct laryngeal jerk following the heart-beat. This fact seemed to me a mystery until, in the course of observations, a satisfactory explanation developed.

It is noteworthy that the proportion of normal males manifesting the tracheal sign is exactly double that of females of the same class, whereas the difference between males and females having pulmonary lesions is not nearly so marked. Now, the type of masculine respiration is diaphragmatic, while that of feminine breathing is costal. In downward movements of the diaphragm the heart also descends to some extent,[1] and probably draws the aortic arch closer upon the left bronchus and thus improves the chances for the transmission of its pulsation to the trachea. After this explanation it is clear why healthy females should fall so far behind normal males in the frequency of the tracheal pulsation. It is also to be expected that the trachea. phenomenon should, in its milder manifestations, be confined to inspiration. It is easy to prove on anyone exhibiting the tug and having good control over the respiratory muscles that the tracheal jerk accompanies inspiration by the descent of the diaphragm, but that it is absent when air is drawn into the chest only by elevation of the ribs.

[1] F. H. Williams. Medical Uses of the Röntgen Light. AMERICAN JOURNAL OF THE MEDICAL SCIENCES, June, 1899, p. 678.

A second conclusion may, therefore, be drawn from these observations, namely, *that in the normal individual descent of the heart with inspiratory movement of the diaphragm may so press the aortic arch upon the left bronchus as to impart to the trachea the aortic pulse, recognizable at the larynx as a palpable tug of greater or less distinctness.*

THE NUMBER OF CASES MANIFESTING VARIOUS DEGREES OF TRACHEAL TUG.

	Age in years.	Males, 245.						Females, 185.					
		None	Slight	d	d′	d″	d‴	None	Slight	d	d′	d″	d‴
I. Normal persons and those without signs or history of pulmonary disease.	0 to 10	3	...	...	...	...	...	2					
	11 " 20	5	1	6	1	1	1	15	4	...	...	...	1
	21 " 30	10	6	12	6	3	...	51	8	4			
	31 " 50	29	6	5	...	...	...	22	7	3	1	1	
	51 " 70	13	2	2	...	...	...	7	1				
	Over 70	1	...	...	...	...	...	2					
II Persons with signs or history of tuberculous, pleuritic or pneumonic affection of the left lung.	0 to 10												
	11 " 20	...	...	1	...	...	...	2	1	1			
	21 " 30	7	8	16	9	2	6	6	7	4	1	...	1
	31 " 50	10	13	10	16	4	5	4	5	5	2	1	2
	51 " 70	...	2	...	1	1	...	...	1	1	2		
	Over 70	...	1	...	...	...	...	1					
III. Persons manifesting marked emphysema or arterio-sclerosis.	0 to 10	1											
	11 " 20	...	...										
	21 " 30	...	...	1	1	...	...	1	...	1			
	31 " 50	3	2	...	...	...	...	1		...			
	51 " 70	5	1	1	1	...	...	3	...	1			
	Over 70	1	1	...	...	...	...	...	...	2			

PRIMARY SARCOMA OF THE THYROID GLAND.

BY AUGUST JEROME LARTIGAU, M.D.,
OF NEW YORK CITY,
TUTOR IN PATHOLOGY, COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY.

THE history of abnormal conditions of the thyroid gland begins several centuries ago. Although traces of näive knowledge of enlargements of the thyroid body, and indeed of true sarcoma of this organ, also date back many years, a close study of the literature bearing on thyroid tumors has brought to light astonishingly few cases of sarcoma, especially of primary sarcoma. From the earliest publication of Alibert, in 1817, the subject passes unnoticed save the three cases reported by Raynaud, Forster, and Virchow, until 1879, when our knowledge of the subject was very materially advanced by Kaufmann. The basis of this observer's study was seven collected cases, three of which he had observed and examined himself.

[1] Read before the New York Pathological Society, May 8, 1901.

The later literature has been enriched by other cases reported from time to time mainly by Continental writers. Thus Morf, after a critical search through the literature in 1899, was able to collect, including his own case, only forty examples of this uncommon disease. To this number I have been able to add fifteen others not included in Morf's paper, thus making a total of fifty-five recorded cases. It is only fair to point out, however, that these figures indicate too great an infrequency. Later statistical investigations will undoubtedly show that primary sarcoma of the thyroid gland is much less uncommon.

According to Mueller,[1] secondary sarcoma is also uncommon. Thus of 102 cases of primary sarcoma elsewhere, metastatic invasion of the thyroid and pancreas was noted in only 3.1 per cent. of the cases.

A consideration of the relative frequency of primary carcinoma of the thyroid, especially as compared with that of sarcoma, is not without interest in this connection. Kaufmann, in 1879, had collected twenty-three cases of primary carcinoma, twelve of which had been studied by himself. Rose, in the same year, published a dozen new cases, and Poncet, in 1899, succeeded in collecting fifty other cases, mostly from the comparatively recent literature. The frequency varies, like that of sarcoma, in different sections of country. Thus, Lücke states that he personally observed ten cases in two years in Berne, and states that in goitrous districts malignant disease of the thyroid occurs with greater frequency than elsewhere.

Limacher, of Berne, in 7641 autopsies found carcinoma of the thyroid 38 times, while Chiari, of Prague, found the lesion only 11 times in 7700 post-mortems. Winniwater collected from the post-mortem records of several German universities 548 cases of carcinoma of the thyroid. Of these, 0.73 were primary in the gland. Among 7294 cases of carcinoma collected from British hospitals, in only seven instances was the thyroid the primary seat of the tumor. The relative frequency is about 3 or 4 to 1 of sarcoma.[2]

The case the subject of this paper was clinically observed in the service of Prof. Weir at the Roosevelt Hospital, and later came into my hands for autopsy. The salient points bearing on the clinical and anatomical features alone shall be given.[3] The following are some of the main features excerpted from the history protocol:

J. M., a married woman, aged forty-five years, born in Scotland, was admitted into the hospital January 3, 1901, complaining of a small mass in the neck. The family history is negative as regards tumors, syphilis, or tuberculosis. Ten weeks before present admission into the hospital the

[1] Cited by Lücke u. Zahn. Chirurg. der Gesch., 1 Theil. Deutsch Chirurgie.

[2] For consideration of primary carcinoma of the thyroid, with bibliography, consult A. E. Halstead, "Carcinoma of the Thyroid Gland," Medicine, Detroit, February, 1901, p. 107.

[3] The author is indebted to Dr. George Emerson Brewer, of New York City, for the clinical side of the case.

patient had been sick with pneumonia; otherwise she had always considered herself a strong and healthy woman. About eight years ago the patient noticed a lump in the middle of her neck at its lower part. It grew very slowly until it reached the size of a small hen's egg. This maximum was attained in about one year. At no time did it interfere either with breathing or swallowing. The patient considered herself quite well until ten days ago, when there appeared within two days a small lump on the right side of the neck just above the middle of the clavicle. Since reaching maximum size on the second day the swelling has remained the same size. On pressure the parts were quite tender. With the appearance of this swelling there developed dyspnœa and dysphagia, which have become more and more severe. There had been no loss of flesh or strength; appetite remained good.

Physical Examination. Patient is a well-nourished woman, whose breathing is labored and stridulous in character, and there is some loss of voice without hoarseness. In the median line of the neck in the region of the thyroid there is a distinct tumor mass. It extends to the left of the median line one and one-half inches, and tracheal rings can be felt beyond the left border of the growth, which is about the size of an orange. The growth is firm and elastic to the feel. Its outline could be fairly well made out, and it appears smooth and rounded. It is not painful on pressure. The overlying skin is freely movable; with deglutition the mass moves up and down, otherwise it appears more or less fixed to the deeper structures. The smaller mass, to which the patient particularly drew attention, is situated on the right side of the neck one inch above the clavicle near its middle. It is about the size of a walnut, somewhat firm, and very tender. The overlying skin is discolored blue. No enlarged lymph nodes are detected anywhere. The temperature on admission was 99.2°, and the urine contained a trace of albumin, but no casts were observed; the specific gravity was 1018. The operation for removal was performed by Dr. Brewer on the day following admission. Without mentioning the technical details of the surgical procedure, it may be said that the walnut-sized swelling just above the right clavicle was shown to be a hæmatoma located beneath the platysma muscle. The main tumor in the mid-neck was found to be encapsulated and not adherent to the anterior structures. The tumor was smooth, apparently cystic in character, and had replaced the right lobe of the thyroid. The isthmus and left lobe looked normal, and were not removed. Considerable trouble was experienced by the operator from the free hemorrhage which occurred in the incised tissues. No enlarged lymph nodes were observed during the operation. For about one week the patient's condition remained satisfactory, but after that it became increasingly worse from the dyspnœa, which became more and more severe owing to the actively recurrent growth which pressed more and more upon the trachea. Further, the amount of urine passed ranged only from eight to twelve ounces daily. On the sixteenth day after operation moderate ptosis of the right eye was observed. Two days later the right pupil was contracted, the left remaining normal. Toward evening general convulsions developed, and the patient died in full consciousness a little later, apparently from asphyxia.

The temperature, which had been 99.2° on admission, never reached normal, but fluctuated irregularly, with an evening rise of 1° to 2° until death.

Description of Tumor Removed at Operation. This has the size and contour of a goose-egg (7 x 5 x 4 cm.). (Fig. 1.) It is uniformly firm in consistence. The whole mass, which consists of the entire right lobe of the thyroid, is sharply encapsulated by a firm fibrous capsule from 1 to 2 mm. in thickness. Attached to the exterior of the latter are several torn fibrous adhesions. On section the cut surface is for the most part smooth, having a dark-red color in some places, but for the greater portion showing irregular but sharply defined tissue of a yellowish or grayish color, extending from the interior of the encapsulating fibrous tissue in the form of strands, or in less definite forms, as though the tumor-infiltration occurred along the connective tissue framework of the organ. Intermingled with this tissue, which is the tumor proper, is a considerable quantity of fresh and partly clotted blood. At one

FIG. 1.

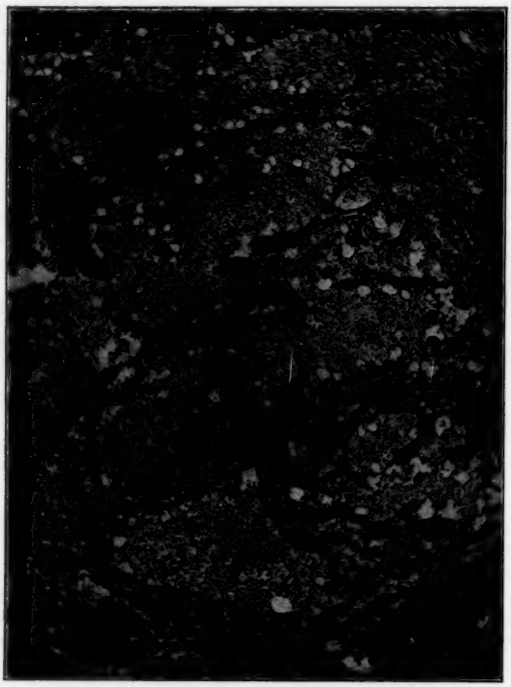
extremity of the specimen is a cavity about the size of a marble (2 cm.), which also contains clotted blood. (Fig. 2.)

Histological Study of the Tumor. Practically the whole of the normal thyroid tissue has been replaced by tumor growth. The fibrous tissue capsule of the specimen for the most part is made up of dense fibrous tissue, but on one side (left) small portions may be seen in which new growth, similar to that of the main tumor, has occurred. At only one portion was invasion throughout the entire thickness of the capsule noted.

The portions of thyroidal tissue which remained uninvolved by new growth showed changes, partly the result of compression. The alveoli of the gland are irregularly distorted into various shapes from large oval or round spaces into mere slits in the tissue, containing some colloid finely granular material and extravasated red corpuscles. The epithelium, although sometimes normal in appearance, is largely compressed or else has completely disappeared. The fibrous tissue framework of the thyroid adjoining the definitely involved portions shows an abundant round, oval, and spindle-cell infiltration indicating the probable mode of extension of the growth along this portion of the organ.

For the most part the tumor consists of extremely cellular tissue containing numerous larger and smaller blood channels filled with blood. The latter are more or less regularly distributed through the cellular tissue, usually separated from it by a sharply defined layer of endothelium. Occasionally, however, they appear to be mere blood spaces lying between the cells of the tumor without any intervening endothelial wall. Here and there within the bloodvessels may be seen large masses of closely-packed cells, often almost occluding the vessel lumen. They are similar to those making up the main tissue of the specimen.

FIG. 2.



The cellular portion proper of the tumor is made up of closely-packed larger and smaller cells whose nuclei take the nuclear dyes strongly. In morphology they conform to the spindle and small and large round-cell variety, with scanty cytoplasm. The spindle-cells predominate. Beside the former cell types a moderate number of cells of intermediate forms are likewise distributed among the main cell types. Occasional mitotic figures are made out showing evidences of both regular and irregular division of the nucleus. The intercellular connective tissue reticulum is observed only in places and is small in amount. Throughout the tissue between the cells may be seen red blood-corpuscles, extremely abundant in some portions of the tissue.

Histological Diagnosis. Angiosarcoma (mixed cells) of the thyroid. The autopsy was made twenty-three hours after death. The brain was not examined, a partial autopsy only having been permitted.

Anatomical Diagnosis. Primary sarcoma of the thyroid body, with well-marked reduction of the tracheal and œsophageal lumina by the pressure of the new growth; fatty degeneration of the heart; chronic diffuse nephritis; fatty liver; intramural nodular fibromyoma of the body of uterus; fibroadenoma of left breast; œdema and congestion of both lungs.

The incision wound in the neck was filled with granulation tissue and clotted blood. The remaining left lobe of the thyroid and isthmus were converted into a tumor mass irregularly oval in form. The whole mass measured 10 x 6 x 4 cm. It was sharply differentiated from the normal structures of the parts and limited above by the cricoid cartilage and extending downward to just above the clavicle. It reached outward to the right as far as the anterior border of the trapezius muscle; across to the left a little beyond the middle line of the neck, forcing the trachea over to the right side. The trachea was compressed from the front and the left toward the right and backward. The lumen was not completely occluded at any point, but was much narrowed. Thus, at the third ring it measured only 4 mm. in diameter. The œsophagus at a corresponding place was also compressed from the front and the left. The large bloodvessels of the neck were normal in appearance, although displaced well to the left side. On section the cut surface of the new growth presented a dark-red appearance, mottled with small, irregularly sized areas of yellow and gray. There was no distinct evidence of encapsulation. Beyond recurrence at local seat, no metastases were found anywhere in the body, although these were searched for with great care, especially in the neighboring tissues, lungs, and bone-marrow.

The microscopical findings of the viscera confirmed the gross anatomical diagnosis. The histological features of the remaining left lobe and isthmus, which were found involved by new growth, were essentially the same as those already described in connection with the tissue removed at operation.

The bacteriological examination revealed the presence of the colon bacillus throughout the body. No clinical significance was attached to its presence, since it was regarded as the result of post-mortem invasion.

To summarize, then, this case is one of angiosarcoma developing in a goitre and pressing upon the trachea, causing death by asphyxiation. No metastatic growths were found anywhere beyond the local seat of the primary lesion.

The close relationship of goitre to the development of sarcoma of the thyroid gland is of the greatest interest, both from the clinical and pathological view-points. Its common association with goitre and frequent occurrence in goitre countries have been known for many years, and recent observations have brought this forward more conspicuously than ever before. A. Morf very rightly remarks: "If we remember how easily a small enlargement of the thyroid is overlooked in a locality where from one-half to one-third of the inhabitants are afflicted

with the disease (Bircher), and also remember that in many of the histories of cases reported no definite statement is made in regard to previous goitre, it is probable that the proportion of cases in which a benign enlargement precedes the malignant growth is larger than appears from the figures."

An analysis of a series of 51 cases of primary sarcoma of the thyroid shows that in 35 previous goitre existed, and in only 16 was it absent. The incidence of thyroid sarcoma at different age periods is not without

ANALYSIS OF 51 CASES WITH REFERENCE TO PREVIOUS GOITRE.

Age period.	Number.	Previous goitre.		No previous goitre.	
		Male.	Females.	Male.	Females.
10 to 20 years	1	1	0	0	0
20 " 30 "	3	1	1	1	0
30 " 40 "	5	1	1	3	0
40 " 50 "	14	5	8	1	0
50 " 60 "	18	6	8	2	2
60 " 70 "	10	2	1	4	3
Total	51	16	19	11	5

some interest. Of eight cases which developed between the ages of twenty to forty, one-half only showed previous goitre, while in a series of thirty-two others in which the sarcoma developed between the ages of forty to sixty so many as 27, or 84 per cent., had had goitre before the development of the sarcoma. This, then, indicates clearly enough that with the increase in age of these cases previous goitre becomes more frequent. With regard to its occurrence in the two sexes it may be said that goitre seems to be more frequent in women; thus, it was present in 59 per cent. of the men and in 79 per cent. of the women.

That sarcoma of the thyroid occurs more frequently in advanced than in early life is a point on which all observers agree. The large majority of them occur after the fortieth year, with comparatively the largest number during the fifth decade.

For the entire fifty-three cases collected in the literature, the greatest number occurred between the years forty to seventy. To this age-period forty-five of the cases belong, while only ten of the fifty-five developed in persons under forty years of age. The earliest age at which primary sarcoma of the thyroid was noted was in a boy, aged eleven years. For reasons which are not very apparent the greatest number of cases occurs between forty and sixty. Morf suggests that this unusual age-prevalence of thyroid sarcoma is perhaps explicable in the light of observations made by Wolfer, who found that the parenchymatous elements of the thyroid become atrophic in later life, this atrophy often being accompanied by copious hyperplasia of the

interacinous connective tissue. For my own part this seems insufficient to explain the facts. The influence of sex upon the development of primary sarcoma of the thyroid is probably unimportant. Among the series of fifty-five cases twenty-eight were men and twenty-seven women. The family history evidently plays little part as a predisposing factor. The disease is said to have followed injury to the thyroid in one or two cases. Pick and Forster were disposed to lay greater stress upon this than more recent writers have done. At all events such a factor is rare.

The relation of the origin of the tumor to the anatomical distribution is variable, but in the majority of cases, whether in men or women, the sarcoma originates in the right lobe of the thyroid gland. In forty-six cases in which this lobe distribution is noted, thirty-one, or 86 per cent., originated in the right lobe, and only fifteen, or 32 per cent., in the left lobe. The origin according to sex is as follows:

Sex.	Right lobe.	Left lobe.
Males (25)	19 = 76 per cent.	6 = 24 per cent.
Females (21)	12 = 57 per cent.	9 = 43 per cent.

From this table it may be clearly seen that the relative frequency of right and left lobe origin of the tumor is somewhat different in the two sexes. Thus in man the right lobe was involved in 76 per cent. of the men and in 57 per cent. of the women, showing a comparatively much higher right lobe distribution in men.

Sarcomata of the thyroid ordinarily grow quite rapidly. The duration of the disease varies from several weeks to over one year. Lücke states that the course of the disease is usually less than one year; perhaps eight months represent the average. Death is often induced by involvement of the trachea or œsophagus, or both.

The mortality shortly after operation for removal of the growth has been remarkably high. This is likewise true for extirpation of carcinoma of the thyroid gland.

The physical characters of sarcomatous tumors of the thyroid are quite variable. The size may not exceed that of a small nodule one or two centimetres in diameter. On the other hand, the mass may be of sufficient size to cover the entire anterior surface of the neck. Ordinarily these tumors consist of more or less regular, firm, nodular masses with smooth surfaces. In a large number of instances, especially in the early period of its development, the tumor growth is apt to be confined within the capsule of the thyroid gland. With fuller and more extensive growth invasion of the capsule and neighboring tissues is common.

When the tumor attains a considerable size the anatomical relations of the tissues of this part of the body become considerably changed.

Anatomical structures may be compressed or displaced, or from newly-formed adhesions to the tumor the walls of bloodvessels may become invaded by new growth or destroyed. Thrombosis of the veins has been observed, followed by greater or less circulatory and respiratory changes, and often by œdema of the neck or even the upper half of the body. The skin overlying the tumor may appear normal, or may be invaded by the neoplasm. Implication of the trachea, larynx, and œsophagus has been noted in a very large proportion of the reported cases. Involvement by compression or extension of the neoplasm to one or the other of these structures occurs in 50 per cent. or more of the cases. This is sufficiently explicable for obvious anatomical reasons. The nerves, especially the vagus and sympathetic, are sometimes involved in the process. From complications of this sort disturbances in the vocal cords, ptosis, pupil inequalities, exophthalmos, unilateral facial thermic perturbations, paralysis of the arm, etc., have followed and been observed in different cases.

Metastasis is common in primary sarcoma of the thyroid. Most writers agree that cervical lymph node, lung, and bone involvement with secondary growth are frequent. In a very large proportion of the cases the former are alone invaded. Next in frequency in the order named come the lungs and bone. The same high proportion of lung and bone metastasis is also true for carcinoma of the thyroid. Dissemination of the growth occurs both through circulatory and lymphatic channels. The numerous cell emboli (sarcoma?) observed in the blood channels and vessels of the case which I have reported in this paper illustrate the former mode of extension quite well, although no secondary growths were observed anywhere beyond the seat of occurrence of the primary tumor. But both Kaufmann and Wolfer have reported cases in which extensive tumor thrombi were found in the large veins.

It has been generally assumed that these rapidly growing sarcomata perforate the connective tissue capsule of the thyroid gland, and thus by extension by contiguity large tumor masses are formed. Braun, on the other hand, believes that these large tumors are formed as often, if not oftener, by coalescence with neighboring tumors which may have originated from secondary foci, such as the cervical lymph nodes, for instance. Within the thyroid tissue itself, as Kaufmann and others pointed out, extension ordinarily occurs along the interacinous connective tissue. From this, pressure and other changes subsequently take place.

The microscopical features of primary sarcomata of the thyroid have been studied by different observers. The greatest diversity in the type of these tumors has been described; but, on the whole, the majority conform in their general morphological characters to either the round

or spindle-celled varieties, or a mixture of both. Angiosarcomata and tumors with bony formations have likewise been reported.

CONCLUSIONS. 1. Primary sarcoma of the thyroid gland is rare, but probably of more common occurrence than statistics show. It is less frequent than primary carcinoma of the thyroid gland.

2. It is commonly associated with goitre. Those cases developing in persons between forty and sixty years of age show a higher percentage of previous goitre than younger individuals. Goitre associated with sarcoma of the thyroid is more common in women than in men.

3. Sarcoma of the thyroid occurs oftener in late than in early life. The greatest age frequency is between forty and sixty.

4. Sex is probably an unimportant element in its development.

5. The primary tumor most frequently originates in the right lobe of the thyroid body. This distribution seems to be more frequent in men than in women.

6. The clinical course of the disease is usually relatively acute.

7. Involvement by pressure or new growth of the trachea or larynx is common.

8. Metastasis occurs through blood or lymph channels, or both.

9. Round and spindle or mixed-celled sarcomata are most common. Angiosarcomata are not rare.

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SPLENIC-MYELOGENOUS LEUKÆMIA, WITH PULMONARY, LARYNGEAL, AND FAUCIAL TUBERCULOSIS.[1]

By Arnold Sturmdorf, M.D.,
of New York.

Chronic leukæmic conditions, when complicated by intercurrent infections, present reactive cytogenetic phenomena.

The influence of the added infection manifests itself by causing a gradual disappearance of the hæmatological characteristics of the leukæmia.

Observations on this point thus far recorded are limited in scope, embracing principally the influence of *acute* infections, especially those of a septic nature; *chronic* infections associated with true leukæmia barely find mention.

In a recent communication on "Splenic-myelogenous Leukæmia with Pulmonary Tuberculosis," by Elsner and Groat,[2] it is stated that "splenic-myelogenous leukæmia combined with tuberculosis is of such rare occurrence that there is practically no literature on the subject at the present time. The rarity of these complications is made positive by the fact, elicited through private correspondence, that clinicians and pathologists of such wide experience as Stengel, Osler, Cabot, Prudden, and Janeway have never seen a case."

The patient which it is my privilege to present here embodies this unusual association of pathological conditions as manifested by clinical and microscopical findings.

The history of the case is briefly as follows:

Mrs. Annie O. N., aged thirty-five years. Married four years. One pregnancy, the child living and healthy; is now two years old. No miscarriages. The patient complains of aphonia, pain on swallowing, cough, night-sweats, and amenorrhœa of three months' standing.

Family History. The father of the patient died as the result of an accident. The mother, one brother and two sisters, one of whom is reported as having recovered from pulmonary tuberculosis, are living and well. One sister died of tuberculosis at thirty-one. The patient

[1] Presented (with demonstration of patient and blood) to the Section on Internal Medicine of the New York Academy of Medicine, May 21, 1901.

[2] American Journal of the Medical Sciences, March, 1901.

was born in Brooklyn. From her second to her tenth year she lived in the northern part of Ireland, after which she returned to Brooklyn, residing there to the present time. Her environment and habits were always good. She remembers only to have had mild scarlatina, whooping-cough, and measles during childhood. Splenic enlargement was first noticed incidentally during her normal puerperal convalescence two years ago. As it caused no inconvenience it was ignored.

Her present illness began on New Year's day, when, without premonitory symptoms or apparent cause, she awoke suffering from throat pain, cough, and hoarseness. A physician, after several weeks of unsuccessful treatment, sent her to Lakewood, where she remained five weeks without apparent benefit. From that time to the present the local conditions became more aggravated, while her general condition deteriorated, the patient losing twelve pounds in weight.

FIG. 1.

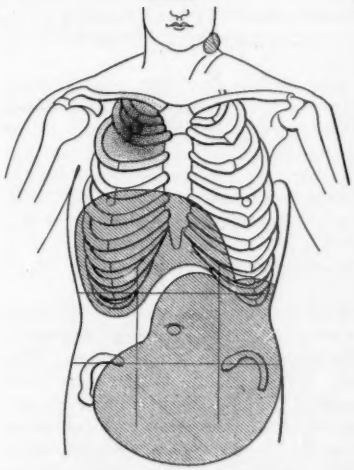
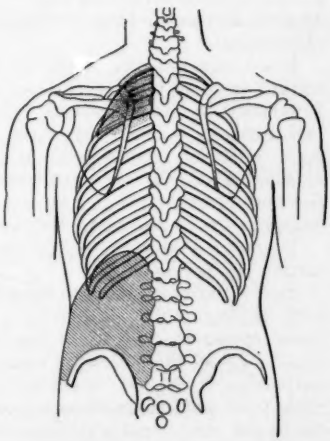


FIG. 2.



Examination on April 17, 1901. A small woman, of slender frame and phthisical habitus. Height, five feet; weight, 112 pounds. No appreciable panniculus. The skin is pale with a grayish-yellow tinge. No icterus. In the flexures of the elbows, groins, and knees are seen red, infiltrated, scaly eczematous patches. The fingers present clubbed extremities. The left submaxillary region contains a packet of enlarged lymphatic glands about the size of a walnut. There are no other lymphatic swellings visible or palpable. Pressure over the sternum and long bones elicits no pain. The abdomen is markedly prominent. There are no visible dilated veins. Temperature 99.5°, pulse 120, respiration 35. Tongue coated. Inspection of the pharynx shows the uvula and left half of the faucial arch, including pillars and tonsils, diffusely red and infiltrated. The junction of the left uvular border and soft palate is deeply fissured. This whole involved area presents a number of discrete, small, round, superficial ulcers, covered by a grayish-yellow coating. The tonsillar crypts are filled with yellow semi-solid plugs.

Laryngoscopical examination reveals a pale, otherwise normal epiglottis. The glottis is obscured by a characteristic pyriform swelling of the left arytenoid and numerous papillomatous excrescences filling the interarytenoid space. The lungs present indistinct cavernous signs between the clavicle and third rib on the right side anteriorly and over the left suprascapular space posteriorly. Examination of the heart proves negative. The liver is large, extending from the fourth rib to a finger's breadth below the free costal margin in the mammillary line. The spleen is enormously enlarged, hard, smooth, and prolapsed; not painful. Its upper pole can be palpated for a short distance beneath the left costal arch. Its anterior border, sharply demarcated, extends over into the right side several fingers' breadth beyond the middle line and presents a distinct indentation at the level of the umbilicus. Its lower pole dips deep into the pelvis, where its characteristic edge can be palpated through the anterior vaginal wall, between bladder and uterus, which latter is crowded backward. Urine hyperacid, deposits a copious sediment of uric acid crystals on standing; otherwise negative. Sputum and smear from the faucial ulcerations show tubercle bacilli in abundance.

Blood examination, April 17th, four hours after last meal, patient resting one hour: Hæmoglobin, 48 per cent. (Gowers); red corpuscles, 2,800,000; white corpuscles, 156,000; ratio about 1:18. Some poikilocytosis, normoblasts, and megaloblasts. No parasites or pigment granules. Differential count shows the following proportions: Myelocytes, 53.20 per cent.; polymorphonuclear neutrophiles, 29.70 per cent.; eosinophiles, 8.80 per cent.; lymphocytes, 7.50 per cent.; basophiles, 0.75 per cent.; transitionals, few.

Therapy: Potassium iodide, saturated solution, gtt. x, t. i. d., to be cautiously increased.

26*th*. Patient presented herself with a temperature of 103.5°, pulse 118, respiration 26. A careful examination failed to reveal any additional causative element in the production of this temperature. The blood showed the following changes: Hæmoglobin, 50 per cent.; red corpuscles, 3,100,000; white corpuscles, 125,000; poikilocytosis as previous; normoblasts and megaloblasts. Differential count: Myelocytes, 31.25 per cent.; polymorphonuclears, 54.25 per cent.; eosinophiles, 5 per cent.; lymphocytes, 8 per cent.; basophiles, 1 per cent.; transitionals, few.

Thus we find that while the sum total of the white corpuscles remained practically the same, the myelocytes showed a reduction of about 40 per cent., and the polymorphonuclears a disproportionate increase.

Therapy: Fowler's solution alternating with the potassium iodide solution, both in increasing doses.

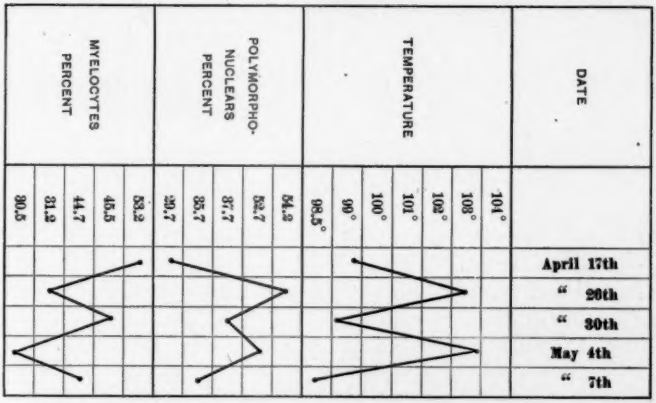
20*th*. Temperature 99°, pulse 80, respiration 20. Blood examination: Hæmoglobin, 52 per cent.; red corpuscles, 3,200,000; white corpuscles, 120,000. Differential count: Myelocytes, 45.50 per cent.; polymorphonuclears, 37.70 per cent.; eosinophiles, 7.50 per cent.; lymphocytes, 8.50 per cent.; basophiles, 0.50 per cent.; transitionals, few; normoblasts and megaloblasts as above.

In the absence of temperature, we find on this day the myelocytes again resuming preponderant percentage, although not to the degree found in the first examination. The polymorphonuclears, on the other hand, while markedly reduced, had not yet fallen to the level of the first count.

Therapy: Arsenic increased; potassium iodide stopped. The temperature remained normal to May 3d, when it rose again, reaching a maximum of 103.6° within forty-eight hours. After oscillating between 101.5° in the morning and 103.6° in the evening for two days, it began to descend, reaching the normal point on May 10th. From that day to the present there has been no recrudescence of the fever.

Blood-counts made during this interval again showed the characteristic percentage transpositions between the polymorphonuclears and myelocytes noted above, each rise in temperature being regularly accompanied by a corresponding increase in the number of polymorphonuclears and a proportionate decrease in myelocytes, as seen in the following:

May 4th. Temperature, 103.6°; hæmoglobin, 50 per cent.; red corpuscles, 2,950,000; white, 122,000; myelocytes, 30.50 per cent.; polymorphonuclear neutrophiles, 52.65 per cent.; eosinophiles, 6.25 per cent.; lymphocytes, 8 per cent.; basophiles, 2 per cent; transitionals, few; normoblasts and megaloblasts, few.



10th. Temperature normal. Blood examination: Hæmoglobin, 52 per cent.; red corpuscles, 3,200,000; white corpuscles, 116,000. Differential count: Myelocytes, 44.75 per cent.; polymorphonuclears, 35.75 per cent.; eosinophiles, 8 per cent.; lymphocytes, 8.50 per cent.; basophiles, 2.50 per cent.; transitionals, normoblasts, and megaloblasts, as above.

At the present writing the patient has been under observation for four weeks. Deductions are obviously precluded. During this period of observation she has been examined personally at least twice weekly. A large number of blood-counts were made, of which those presented above show the most characteristic fluctuations. The counts were invariably made four hours after the ingestion of the last meal. These fluctuations may be summarized as follows:

The occurrence of febrile temperature is accompanied by a characteristic alteration in the relative proportions, but not in the sum total of the white corpuscles. This alteration is manifested principally in the polymorphonuclear and myelocyte elements, the polymorphonuclear

count rising parallel with the temperature curve, the myelocytes decreasing proportionately. The chart on preceding page elucidates this more graphically.

This rapid increase in the number of polymorphonuclears suggests an intercurrent leucocytosis. Between the first and last observation made in our case the proportion of white to red corpuscles oscillated from 1:18 to 1:27. Taking normal variations and similar factors into consideration, this difference in the ratio can be discarded. An actual decrease in the myelocytes, however, can be noted, the afebrile count showing a reduction of from 53.2 per cent. to 44.7 per cent., while the febrile count also shows a drop from 31.2 per cent. to 30.5 per cent.

I desire here to express my thanks to Drs. Louis Heitzmann and M. S. Kakels for control counts.

A CASE OF CERVICAL AND BULBAR TABES, WITH NECROPSY.[1]

By Solomon Solis Cohen, M.D.,
of Philadelphia,

and

William G. Spiller, M.D.,
of Philadelphia.

Clinical Report by Dr. Cohen.

The case that forms the subject of the present paper was reported to the Philadelphia Neurological Society in 1889 as a case of "Bulbar Paralysis, with Marked Disturbances of Pain and Temperature Senses and Other Phenomena Pointing to Syringomyelia," and the report was published, together with remarks by Dr. Charles K. Mills, who had seen the patient in consultation, in the *Medical and Surgical Reporter* for July 13, 1889, p. 34 *et seq.* Despite the caution observed by Dr. Mills and myself in the title of our report as just quoted, abstractors and authors have referred to the case as one of undoubted syringomyelia with bulbar symptoms, and as such it has entered into, and to that extent vitiated, the statistics of the affection in question. The results of the necropsy and of Dr. Spiller's careful study of the brain and cord show that the disease causing the somewhat unusual phenomena reported was a rare form of tabes, and not syringomyelia. It is to be hoped that this supplementary record will at least obtain sufficient reading to prevent future incorrect references.

Following Dr. Spiller's suggestion I shall repeat almost in full the previous report, as the symptomatology does not readily lend itself to further condensation and is of great importance. In 1889 the following description was given:

[1] Presented at the meeting of the American Neurological Association, June, 1901.

The patient is a man, aged fifty-five years, tall, large framed, and of powerful build. He has weighed 230 pounds, and has been capable of feats of great muscular strength. Thirty years ago he contracted the initial lesion of syphilis. He has had secondary but not tertiary symptoms. He cannot give the exact date of the onset of his disease, which probably developed insidiously. In 1872, however, he had attacks of nocturnal incontinence of urine, following relief of a stricture by dilatation and internal urethrotomy, and this symptom has persisted more or less ever since. In 1878 or 1879 his right eye gradually became affected with a peculiar form of ptosis. The lid is closed, but it is possible for him to open it and to keep it open. He finds it more comfortable closed, and hence ordinarily keeps it so. The pupil, he states, was contracted at the time referred to, that of the left eye being dilated. Some years ago, suddenly and without apparent cause, the left pupil contracted and the right pupil dilated. In 1886, being annoyed by a constant biting of his cheeks, he had several teeth extracted. He felt no pain upon their removal. Since that time the present condition has gradually developed. The symptoms now presented may best be described in groups, as they affect motion, sensation, special senses, and organic functions, including nutrition.

Motion. The right side of the face is partially paralyzed. The eye is closed—that is to say, there is apparent ptosis. It is only apparent, however, for the patient can raise the lid at will and does so to do any work. He keeps the eye closed, however, when reading or writing. He can open and close each eye independently of the other. He has very nearly perfect motion of the eyeball, but there is some slight impairment in the internal rectus and in the superior oblique—not noticeable, however, except upon careful testing. The pupil is slightly dilated, but responds at times both to light and accommodation. When I first saw him, a year ago, it was almost completely dilated; a week or two afterward it became contracted; a little later it again dilated to its present condition, its diameter being larger than that of its fellow. The forehead, in elevation of the brows or in frowning, wrinkles nearly as much upon one side as the other, there being an equal number of lines, but somewhat less distinct in the nasal half of the right side. The fan-shaped lines around the eye are nearly as distinct upon the right as upon the opposite side. Below the eye there is a more marked paralysis. The labio-nasal fold is not so prominent as on the other side, but there is no drawing of the mouth when at rest. The lips apparently move equally on both sides in smiling and talking, but the patient cannot whistle, and in the attempt to pucker the lips a somewhat triangular aperture with the apex pointing downward and outward appears at the right side. Prehension and suction are difficult, so that he has gradually been compelled to reduce, and finally almost to abandon smoking. Mastication is quite difficult, and very imperfectly performed. There is considerable difficulty in deglutition, so that solid foods must be washed down with water. Saliva accumulates to a great extent, on account of the difficulty in swallowing it; it can be ejected, but there is some impairment in this action also. There is a sucking-in or drawing-in of the cheeks, probably due to a tendency in the lower jaw to fall slightly, and of the cheeks to fall into the space between the upper and lower teeth. The tongue exhibits fibrillary tremors. It is protruded to the left, though it can be moved in all directions. There is hemiatrophy, the

left side being the smaller. The difference between the two sides is not so marked at present as when the case first came under observation—that is to say, the right side has undergone partial atrophy as well. The various motions of the tongue can be performed, though with some difficulty. There is no paralysis of motion of the palate or of the larynx. Speech is somewhat thick, the greatest difficulty in articulation affecting the labial and sibilant sounds. It has improved slightly under treatment. The patient's grip is good, his power of locomotion unimpaired, and he is not conscious of any paralysis of the limbs. However, the right leg at times feels somewhat heavy; and he admits he is not able to lift as heavy weights or to walk as great distances without fatigue as formerly.

Sensation. This varies from day to day, but the following are the principal constant conditions: Tactile sense in general is almost perfectly preserved; at time, there are places upon the face, lips, and within the throat where it seems blunted. The temperature sense is both blunted and perverted upon the right side of the face, more markedly below the eye, where cold is at times called warm. On the trunk and limbs the temperature sense is preserved, but the patient experiences a peculiar feeling of faintness upon the application of cold water, so that he cannot use it for bathing or washing. He has had to abandon sea-bathing for this reason. He could wade into the sea until the water reached the upper third of the thighs, but beyond that it would cause this peculiar feeling of shock with sense of impending dissolution. The pain sense is peculiarly blunted; it is absolutely gone so far as sharp points are concerned in the right side of the face, on the neck, and in irregular areas over the trunk and thighs. These, so far as observed, do not appear to be in relation to particular nerve distribution, but the patient could not submit to the very prolonged and tedious examinations necessary to accurately define the limits of the analgesic areas, which affect both sides of the trunk, more especially above the line of the nipples, both arms and both thighs. To the continued electric current, sensation is perverted. Upon the left side of the face galvano-cutaneous sensibility is almost completely absent; but there are a few points, especially in the canine fossa, where it is so acute as to be absolutely painful. Sudden interruptions of the current are felt as blows referred to the cathode, even upon places where the tingling of the uninterrupted current is not felt. Taste and light sensations can be awakened by interruption of strong currents. Sensation to the faradic current seems preserved at all points, though perhaps quantitatively diminished. Itching of the eyelids, especially of the right side, is frequent. Occasionally neuralgic pains affect the legs, especially the right, and sometimes there are griping pains in the abdomen, not due to indiscretion in food or ordinary causes. There has never been headache. At times there is overpowering drowsiness; the head drops forward, and there is a sensation as of cold water being poured over the neck, followed by intense heat.

Special Senses. Hearing is unimpaired. Smell is somewhat impaired. Taste is absent from the anterior portion of the tongue, but upon pressing the sapid substance—salt or sugar—against the hard palate with the tongue, taste is recognized. The patient says that he detects flavors of food swallowed. Sight is much impaired. No ophthalmoscopic lesion was discovered by Dr. Jackson, who, indeed, found vision exceed-

ingly good. Dr. Jackson gives the following notes of the condition of the eyes:

"Mr. X. was first seen with Dr. Cohen, February 14, 1888, on account of an irritable ulcer of the cornea, which, under the use of eserine and applications of hot water, had quite healed ten days later. At this time it was noted that the pupils were small and reacted very slowly and imperfectly. The patient again came under observation, August 31, 1888, and was seen several times in the succeeding three months. During this period there was no material change in the condition of his eyes, which is as follows: He complained of inability to read or use his eyes in business, and the right eye was constantly kept closed by complete relaxation of the elevator of the upper lid, without any contraction of the orbicularis. Nevertheless, when requested to do so, he opened his eye fully without evidence or sense of excessive effort, and kept it open as long as desired for purposes of examination.

"Both eyes presented compound hyperopic astigmatism, requiring for its correction:

R. + 1.50 sph. + 1.25 cy. axis 120, giving V. = 5/v partly.
L. + 2 sph. + 0.62 cy. axis 90, giving V. = 5/iv most letters.

"His color perception was normal.[1] Fields of vision for form and colors were normal or very slightly contracted concentrically; that is, they were a little smaller than the average normal field, but of normal shape. The ophthalmoscope showed that the optic disks were rather anæmic and 'suspiciously gray,' but they could not be pronounced positively abnormal. Fundus otherwise normal. Media clear.

"The pupils were unequal. Right circular, 6.5 millimetres in diameter; left slightly ovoid with long axis vertical, measuring 4.5 mm. These were the dimensions of the pupils with the visual axes about parallel. There was no power of accommodation, but with strong convergence the pupils very slowly contracted to right 5 mm., left 3.5 mm., and upon relaxing the convergence they very slowly dilated to their original size. They gave no reaction whatever to light.

"The extra-ocular muscles showed power of abduction 10°, adduction 30°, sursumduction sometimes as high as 6°, sometimes as low as 1°. Vertical diplopia produced by a prism with its base up or down showed exophoria (tendency for the visual axes to diverge), varying from nothing to 5° when looking at an object directly in front. A red glass placed before one eye caused crossed diplopia, which increased as the eyes were turned toward the right, and disappeared on looking to the left (special weakness of the right external rectus). With horizontal diplopia, produced by a prism so placed as to cause a horizontal displacement of the image on one retina, the visual axes sometimes remained on the same level; sometimes the right was directed higher than the left, sometimes the left higher than the right (right or left hyperophoria). Without the use of the red glass, or some such intervention, there is no squint and no diplopia, but he gives a history of diplopia in other years."

The patient states that he cannot read or write for long periods, on account of failure of vision, and on account of dimness he has recently

[1] But the tones perceived by the right eye were always somewhat different in intensity from those perceived by the left. White at times appeared slightly "yellowish-red" to the right eye; but it could, nevertheless, detect a very faint blue.—S. S. C.

been compelled to intermit his occupation in the machine and carpenter shop he had fitted up in his home to employ his time. Within a few weeks he has occasionally experienced sudden attacks of transient blindness, accompanied with vertigo. He has had subjective vertigo, without visual disturbance occasionally, for many years. He has never fallen or lost consciousness in any of these attacks. There is no other visual disturbance.

Organic Functions. The heart's action is feeble and irregular. The heart is slightly dilated, but not sufficiently so to account for the disturbance of its rhythm or the enfeeblement of its contractions. At times there are attacks of palpitation. The pulse is soft and will average some eighty odd beats in the minute. There is rarely intermittence. Respiration is free and regular, and normal in its acoustic phenomena. Dyspnœa upon exertion is recent and inconstant. Digestion is not perfect, but offers no special neurotic phenomena. The appetite is failing, and assimilation does not seem to be good. Urination is at times difficult, at times involuntary. Incontinence occurs only at night, at irregular intervals, varying in duration from one to three or four nights. It is a frequent symptom. When there is no incontinence the urine is, as a rule, scanty, varying in quantity from sixteen to forty fluidounces per diem. It is of high color, odor, and specific gravity, containing an excess of urates and phosphates, some calcium oxalate, abundant mucus and epithelium, but no casts, albumin, or sugar. Defecation is irregular, constipation alternating with diarrhœa, the latter often being difficult to control. Recently there have been involuntary, but never unconscious, movements of the bowels at night. Sexual power has gradually become impaired, and has for some months been lost. Nutrition is evidently much impaired. There has been a loss of sixty pounds in weight in six months. The loss has been oscillatory, but, on the whole, progressive. It is more than can be accounted for by difficulty of deglutition, and has occurred despite special attention to the digestion, and the continuous use of highly concentrated and predigested aliment. The muscles are flabby, and, while of good bulk for a less massively designed person, are evidently wasted from former conditions. There are no fibrillary tremors.

Reflexes. The knee-jerk and muscle-jerk are well preserved. The palate reflex is good. The presence of an electrode on the base of the tongue, or in the œsophagus or larynx, induces excessive gagging, even when used merely as a sound; and this becomes intense upon passage of the weakest current, the latter being extremely painful. Tactile sensation in these regions varies, but is apparently somewhat perverted, and the pain and temperature senses are blunted but not lost.

Mentality. The intellectual function is good. There is some disposition to repetition of old stories, and a forgetfulness of details, but the patient being called upon to bring order out of the complicated accounts of a relative's insolvent estate, was able to do so with great ease and clearness of judgment. There are occasional alarming dreams, but probably no more than anyone might have.

Co-ordination is apparently perfect. The patient can execute complicated movements with precision, can stand with his eyes closed, and can balance himself on one foot.

Electrical Reactions. All the muscles respond to a faradic current, though with greatly diminished activity, especially on the right side of

the face. Sensation to the faradic current is preserved, but blunted. To the galvanic current response is good in the limbs, but much diminished in the face on both sides, the right more markedly. There are no degenerative reactions. The current produces marked hyperæmia of the part to which the cathode is applied. The patient, during the winter, would frequently complain, on entering the office, that his nose was icy cold, and it would appear blanched, and have a sensation of coldness to the touch. The constant current of a strength of from 2 to 4 milliampères would, in a few minutes, restore the color and warmth. This (cathodal) application was excessively painful.

While the question of diagnosis, and not that of treatment, was the one to be discussed at the meeting to which the foregoing report was made, it was thought well to say that the electric applications appeared to have kept up the nutrition of the facial muscles to a degree greater than could have been maintained otherwise. There had been considerable improvement in the motion of the brow, and in articulation, and the face had not wasted to the same degree as the body generally. General galvanism had also been employed, but not so thoroughly as the facial applications. Digitalis and strophanthin for the heart, in alternation; strychnine constantly for general nutrition; and at different times arsenic, mercuric chloride, auro-sodium chloride, or silver nitrate in the attempt to hold in check the neural degeneration; with temporary expedients to assist digestion, facilitate urination, and repress unpleasant symptoms of various kinds, had been employed after it had been demonstrated that mercury specifically and potassium iodide were alike useless. Malt, alcohol, coca, and the most easily assimilable and concentrated articles of food, including beef peptonoids, peptonized milk, etc., constituted the diet.

The patient lived for nearly twelve years after this report, dying in 1900 from pulmonary œdema consequent upon innutrition, following complete paralysis of deglutition. The history during this period was one of progressive but slow emaciation and loss of strength generally and in both extremities, with decided atrophy of the hands, especially of the left hand. The complaints of "sucking-in of the cheeks" increased, but prehension and suction still remained sufficiently good to permit both pipe and cigar to be enjoyed at various times. There was much irregularity as to this, as also in regard to distinctness or thickness of articulation. Taste was largely lost, and common sensation in the mouth and tongue became so poor that the patient would often lose his food in his mouth and have to find it and push it into the grasp of the pharyngeal muscles with his fingers. For this reason he took only such food as could be swallowed in large morsels, with little chewing or buccal manipulation. The tongue could be moved readily, but was atrophied apparently equally on both sides. There was considerable pain along the ulnar surface of the right hand, and the patient always bent the little and ring fingers out of the way in shaking hands on account of the pain caused by pressure upon them. He also began to complain greatly of pain in the abdomen, and any accidental touch

upon it caused great distress. The darting pains down the right leg occurred less frequently, but with greater severity, and morphine or one of its succedanea was necessary at times to give relief. The abdominal pain could not be relieved by internal medication, but the patient was able to manipulate his own abdomen with various analgesic oils, or to place upon it warm cloths and the like. These applications were frequently followed by relief for prolonged periods. It was evident, and it was stated to the patient, who had himself studied medicine although he had never practised, that the pain was not local but due to involvement of the nerve roots. Notwithstanding this he found relief in the local application, whether by physical action, reflex or local, or by psychical action. Mentality continued excellent, however, to the last.

There were during the last years a few transient attacks of vertigo; never a gastric crisis; never ataxia or abasia. He had two attacks of uræmia—one about two years before death, and one about ten days preceding the fatal illness. The former seemed to have been superinduced by relatively excessive doses of heroin, self-administered, to relieve unusually severe attacks of pain. The quantity taken was one eighth of a grain every hour for some four or six hours. Unconsciousness, however, was not caused by cessation of renal secretion, but apparently by the drug, as it occurred after the morning evacuation of the bladder, which, when I saw the patient, was nevertheless over-distended, and from which nearly twenty ounces were removed by catheter. Secretion, however, after this became deficient, almost absent, and death was apparently imminent. Under treatment by persistent hypodermoclysis with physiological saline solution, the hot air bath, and the free use, hypodermically, of nitroglycerin, spartein, strychnine, musk, and camphor, consciousness was regained in about seventy-two hours and was followed by recovery. Convalescence was slow. A catheter urethritis developed, which, however, yielded to appropriate local measures and internal medication.

After this some enfeeblement of memory was noticed, though perhaps not more than the age of the patient might account for. He had to make memoranda of matters to be attended to or inquired about, but that gave him sufficient clue to start the train of thought going. His reasoning powers were still clear; he preserved his interest in books and affairs, and continued to potter around his workshop. He complained, however, that he could not continue at work very long without fatigue, and especially that the pressure of the handle of instruments upon the palm was painful. His writing was good. His chief anxiety arose from progressive failure of vision. Dr. Schneidemann from time to time examined the eyes, and favors me with the following abstract from his books of the more important data:

"Mr. X. was first seen by me January 14, 1896, in Dr. Jackson's absence, he being a patient of Dr. Jackson. From May, 1896, to June, 1898, Dr. Jackson was in the city, and I did not see the patient. On October 17, 1898, he consulted me and once again early in 1899. May, 1899, he was seen by Dr. Jackson. He again consulted me for the last time, October 31, 1900. His chief complaint in all of my interviews with him was irritation of the conjunctiva, such as smarting, scratching, burning, etc. In fact, his principal object in coming was to endeavor to obtain relief from these symptoms. Certain abnormal

ocular conditions were present when I first saw him, which persisted with slight changes.

"The right eye presented the appearance of pretty complete ptosis. He was, however, able to raise the lid by voluntary effort, but only did so for some special purpose when asked to, but not ordinarily, as for the purpose of using the eye in conjunction with its fellow for vision. The left eye presented no anomaly of the muscles of the lid.

"The refraction was hypermetropia with astigmatism in both eyes, which varied but slightly at different examinations. October 31, 1900, I prescribed –

O.D. $+ 3.50 \bigcirc + 1.$ cy. ax. 125
O.S. $+ 4. \bigcirc + 0.62$ cy. ax. 90

for near use, the distance correction being:

O.D. $+ 1.50 \bigcirc + 1.$ cy. ax. $125 = 4/8.$
O.S. $+ 2. \bigcirc + 0.62$ cy. ax. $90 = 4/5 +.$

"The pupils were irregular, their size variable, the right constantly larger than the left. Light reaction was absent at each examination, but contraction was present upon convergence of the visual axes (Argyll-Robertson pupil). At the examination first made by me (1896, etc.) the posterior media were found to be clear. In January, 1899, there was some beginning cortical opacity of the lens of the right eye. This continued to progress so that when I saw him again, October, 1900, the patient himself recognized that the vision in that eye was failing. It did not, however, fall below 4/8, as above mentioned. At this time the lens of the left eye began to show some disturbance.

"The fundi never exhibited any positively significant lesions. The fields of vision for form and color were normal. The nerves did not present any marked departure from the normal, although a suspicion was entertained at times that the color was rather pale; crescents of partial choroidal atrophy were present, but not more marked than is often the case.

"A marked degree of exophoria could be brought out, increasing as the patient looked to the right, and almost diminishing to 0 as he looked to the left; also, very slight right hyperphoria on looking to the right, none on looking to the left. Abduction was 10, and adduction 30 centrads."

The attack of uræmia about ten days before death followed a chill consequent upon exposure in an attempt to assist a carpenter who was repairing the windows in the machine shop. Recovery from the suppression of urine, and the unconsciousness attendant upon it, was more prompt than upon the previous occasion, though the attack was followed by considerable weakness and a greater loss of memory was apparent. Indeed, there was a partial aphasia—that is to say, the patient utterly failed to recall the particular word desired, though perhaps that same word would come readily at another time. He was, however, convalescent and moving around the room, when suddenly one night his utterances became so indistinct that he could not be understood by those about him, and when seen the next morning there was considerable paralysis of the left side of the face and throat. Swallowing was impossible. Articulation was impossible unless the jaw was held shut, when some motion of the lips could be made, and a few words made out. Once or twice during the attack this condition passed off tem-

porarily, so that he could speak one or two words in answer to questions—a fact by which we proved that he had preserved consciousness and was not in coma. He could move his hands and feet, and the paralysis seemed to be chiefly in the muscles closing the jaw and the palate and pharynx. He could even protrude the tongue with some difficulty. As from thirty to sixty ounces of urine were passed daily, and as the heart's action and respiration kept up very well, this last phase of the illness could not be attributed to uræmia or to cardiac failure. This condition lasted nearly four days. The breathing became labored, and the temperature elevated, about twelve hours before death, during which period there was unconsciousness. Death took place apparently from œdema of the lungs. As neither food, water, nor medicine was given by the mouth, there was no possibility of "deglutition pneumonia." The saliva ran out of the mouth at first, but toward the last secretion ceased.

At the autopsy made by Dr. David Riesman, in the presence of Dr. Charles K. Mills, Dr. A. A. Eshner and myself, examination of the thorax and abdomen was not permitted, but we were allowed to remove the brain and spinal cord. The description of the external appearance of the cadaver and the macroscopic aspects of the brain and cord, as dictated by Dr. Mills, follows:

"October 21, 1900. Body of a normal white man, about middle height. Rigor mortis intense. Superficial abrasion on the inner side of the left thigh. Some red spots on the right leg below and over the knee. Face has a peculiar, bluish-gray color (argyria). Nipples also present a bluish-gray color, added to the natural brown. Marked atrophy of the interosseous muscles, and also of the extensor minimi digiti, especially on the left. Hands seemed flexed, thumbs abducted (rigor mortis). Nail-beds bluish-gray in color, especially at base. Body has been injected. Cup-marks from the first to the fourth interspace on both sides. Marked atrophy of the left arm and forearm, particularly the forearm. Left thigh also atrophic, but not markedly so. Marked atrophy of the left calf-muscles. No atrophy of the muscles of the foot.

"Scalp thin. Skull thinner than normal generally. Dura not adherent. No excess of fluid. Fissures deep. Pia arachnoid œdematous and somewhat opaque. Basilar artery exceedingly long and greatly dilated throughout its course. In whole motor region (fronto-Rolandic) from posterior central convolution forward to precentral sulcus, the convolutions are atrophied and the general area presents a depression. The sulci are usually deep and wide, particularly the two limbs of the fissure of Sylvius. The posterior portion of the third frontal is also involved (the whole of operculum and some surrounding tissue), and the foot of the third frontal. On the right side is a recent meningeal hemorrhage at the upper portion of the ascending frontal convolution. There is a marked depression in the situation of the first frontal convolution on the right, forming a shallow trench, oval in shape, the size of a thumb, near the median edge of the hemisphere. The anterior end of the depression is about one inch from the tip of the hemisphere, and the posterior end is near the anterior extremity of the callosomarginal fissure. There is a depression also on the median aspect, of the same size, immediately posterior to the one on the lateral aspect, extending from the gyrus fornicatus to the edge of the hemisphere. On cut-

ting off the occipital lobes by Dejerine's method, a marked difference appears in the transverse section of the exposed lateral ventricles, the left being nearly twice as large as the right, and oval rather than circular. The choroid plexuses are dark. The left lateral ventricle (on making sections at the level of the callosum) is apparently somewhat larger than the right. The difference in the previous section is due probably rather to dilatation of the posterior horn than to that of the ventricle itself."

After the report of this case to the Neurological Society the diagnostic interest to the attendant gradually faded, becoming replaced by the human interest. Scientific observations and records were not systematically made, attention being given rather to the conservation of strength and the palliation of symptoms. Whether or not therapeutic measures which were continued practically as reported in 1889 are to be given credit for the slow progress of the case it is impossible to say, because the long duration of symptoms before the patient came under observation showed that, for some reason, the tendency to extension was not active. It is possible that closer study during the terminal years might have revealed during life the exact nature of the case, but the diagnosis, ante-mortem, proceeded no further than to postulate a slowly progressive degenerative lesion of irregular distribution, principally affecting the bulbar and upper cervical region, bilateral, though chiefly affecting the right side, and involving the posterior nerve roots at various levels of the cord. Dr. Spiller's careful and able study and analysis will show in how far this was correct, and wherein it failed.

Microscopical Study and Comments by Dr. Spiller.

(From the William Pepper Clinical Laboratory, Phebe A. Hearst Foundation.)

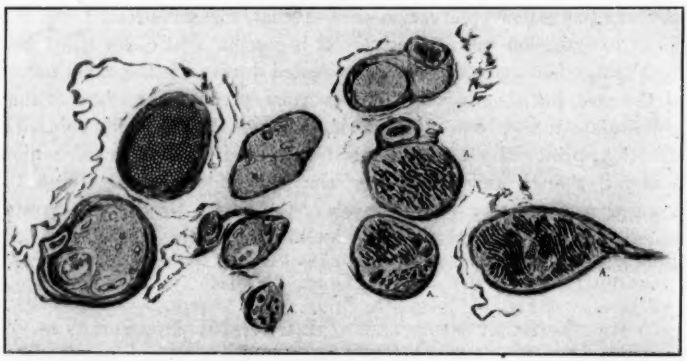
No distinct degeneration is found in the posterior columns in the mid-lumbar region. The nerve fibres along the posterior septum are not quite so numerous as elsewhere in the posterior columns, but no positive degeneration is found even here. Some of the bundles in the extramedullary portion of the posterior roots show a slight degeneration, but the medullated nerve fibres passing into the posterior horns are numerous. It is doubtful whether the anterior roots could be regarded as at all degenerated. When the lumbar posterior roots are collected and cut separately from the cord so that a large number may be obtained in transverse sections, very little degeneration of these roots is seen. The nerve cell bodies in the anterior horns are numerous and are apparently normal.

In the mid-thoracic region there is no pronounced degeneration of the postero-median columns. The nerve fibres possibly are not quite so numerous along the posterior septum as in a normal cord, but the diminution in the number of the fibres, if it exists, is very slight. When a large number of posterior roots are cut separately from the cord they are found to be much degenerated, and some of the bundles

contain no medullary nerve fibres at all, and others very few such fibres. (See Fig. 1.) Even macroscopically the atrophy of the posterior roots of this region was very perceptible when the spinal cord was examined. The bloodvessels within the degenerated posterior roots have much thickened walls and are of a glassy, homogeneous appearance when stained with ammonium carmine. A slight area of sclerosis is seen on the median side of each posterior horn in the area of the root entrance zone.

In the lowest cervical region, at what is doubtless the eighth segment, the posterior columns appear to be normal except in a narrow band within the column of Burdach along each postero-lateral septum and in the right root entrance zone. The left root entrance zone appears to be almost normal. This narrow band of slight degeneration along each postero-lateral septum is the result of partial degeneration of posterior roots in the upper thoracic region. The root entrance zone on the right side in the eighth cervical segment is much degenerated, as is also a portion of the extramedullary posterior root of this segment.

FIG. 1.



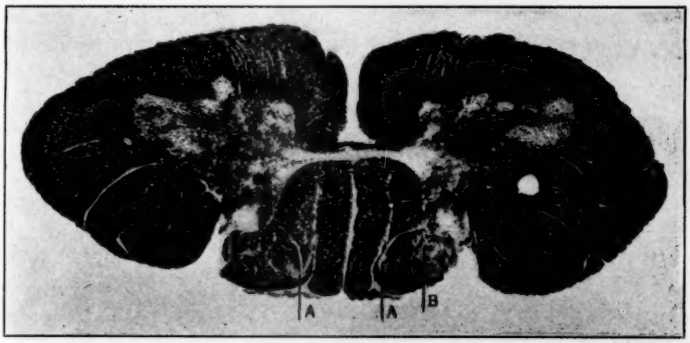
Posterior roots of the mid-thoracic region, cut transversely. The bundles A, A, A, A are much degenerated. The nerve fibres have entirely disappeared in the other bundles.

At the cervico-thoracic junction—*i. e.*, a little lower—the posterior roots in their extramedullary portions are intensely degenerated. At the eighth cervical segment the posterior root on the left side is almost normal. On the right side the posterior roots in the lower cervical segments (see Fig. 2) are partially degenerated, and fewer medullary fibres are found entering the right posterior horn than the left ; at the mid-cervical region no degeneration even of the right posterior roots is seen. A small but distinct area of degeneration in the lower cervical region above the eighth segment is found in each column of Burdach near the periphery of the cord and adjoining the postero-lateral septum, and is in the same position as in the eighth cervical segment. It is the result of degeneration of upper thoracic posterior roots. The degeneration of the posterior roots in the cervical region is almost confined to the right side and the lower cervical levels. No recent degeneration is detected by the Marchi method in sections from the lower cervical region, and the process was evidently not acute. The anterior roots are normal.

No distinct round-cell infiltration of the pia of the cord is present. The nerve cell bodies in the anterior horns are numerous and highly pigmented, which is not extraordinary in consideration of the age of the patient.

Sections from the lower part of the medulla oblongata show no degeneration with Marchi's stain. The nucleus of the left twelfth nerve in its inferior portion is much smaller than the corresponding portion of the right twelfth nucleus (see Fig. 3), and contains fewer nerve cell bodies and fewer medullated nerve fibres. The intramedullary nerve fibres of the left twelfth nerve are not so numerous as those of the right in the inferior portion of the medulla oblongata, but at higher levels a distinct difference between the two nuclei and the intramedullary fibres of the twelfth nerves cannot be observed, and there is no distinct degeneration of these parts. The extramedullary portion of each twelfth nerve is normal.

FIG. 2.



Photograph of a transverse section of the spinal cord from the lower cervical region. A, A. Narrow band of degeneration along each postero-lateral septum, the result of partial degeneration of posterior roots in the upper thoracic region. B. Degenerated root entrance zone on the right side. The corresponding zone on the left side is not degenerated.

The posterior nucleus of the tenth nerve is normal on each side. It is difficult to determine a moderate degeneration of the nucleus ambiguus, but on neither side is this nucleus distinctly degenerated. Some of the nerve cell bodies in this nucleus on each side are much pigmented. The fasciculus solitarius on the left side is greatly degenerated, but on the right side this fasciculus is normal. (See Fig. 3.)

Along the floor of the fourth ventricle are proliferations of neuroglia forming irregular projections into the ventricle.

The lemniscus is normal.

There is some slight perivascular round-cell infiltration in the pia and within the medulla oblongata, but this is not important.

The seventh nucleus and intramedullary fibres of the seventh nerve on each side are normal. The extramedullary portion of the left seventh nerve is probably slightly degenerated, but sections from a corresponding portion of the right seventh nerve appear to be normal.

The nucleus and intramedullary fibres of each sixth nerve appear to be normal. The right sixth nerve in its extramedullary portion is par-

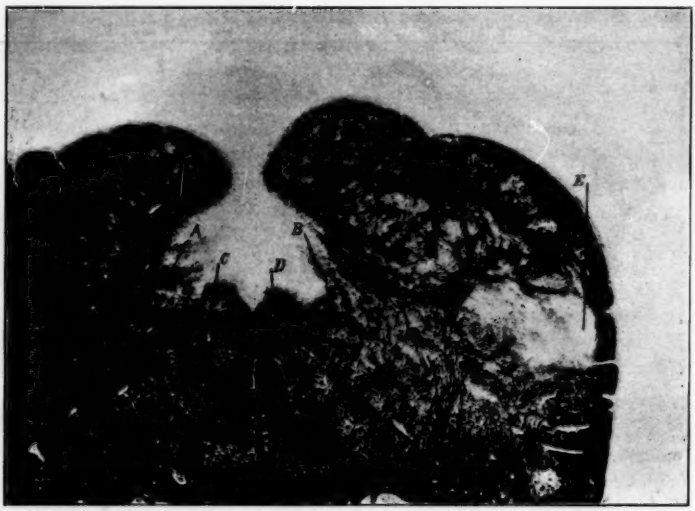
tially degenerated, while the left sixth nerve in the corresponding portion is apparently normal.

In the sections examined the fifth motor and sensory nuclei are present only on one side, and these nuclei are normal. A transverse section through the extramedullary portion of the left fifth nerve near the pons shows considerable degeneration of the nerve roots. The spinal root of the fifth nerve on each side is much degenerated, and possibly the ventral portion is a little more degenerated than the dorsal in the inferior part of the medulla oblongata.

The right cerebral peduncle is considerably smaller than the left.

Sections through the oculomotor nuclei contain many nerve cell bodies in each lateral nucleus and in the median nucleus, but the nerve cell

FIG. 3.



Photograph of a section from the lower part of the medulla oblongata. The nucleus of the left twelfth nerve (D) is much smaller than that of the right twelfth nerve (C) at this level. The descending root of the ninth and tenth nerves on the left side (B) is degenerated, while that on the right side (A) is normal. The spinal root of the fifth nerve (E) is degenerated on each side, but not so completely as the photograph represents, as under the microscope it contains a few nerve fibres.

bodies in the left lateral nucleus are distinctly fewer than in the right, and cell bodies in all parts of the oculomotor nuclei are atrophied, deeply pigmented, and have peripherally situated nuclei. The contrast is striking in comparison with nerve cell bodies of an oculomotor nucleus believed to be normal.

The giant-cells of the left paracentral lobule are normal, but in some portions of the cortex from this part the capillaries are very numerous.

The right optic nerve appears to be normal, but the left is partly degenerated.

The important findings in this case are: Degeneration of the posterior roots of the spinal cord, hardly perceptible in the lumbar and lower thoracic regions, very distinct in the middle and upper thoracic and on the right side in the lower cervical region but absent in the middle and upper cervical regions. No distinct degeneration of the columns of Goll, and very slight and limited degeneration of the columns of Burdach in the upper thoracic and cervical region; atrophy of the inferior part of the left twelfth nucleus; integrity of the extramedullary roots of the twelfth nerves; intense degeneration of the left descending root of the ninth and tenth nerves, possibly a slight degeneration of the extramedullary portion of the left seventh nerve near its exit from the medulla oblongata; partial degeneration of the extramedullary portion of the right sixth nerve; intense degeneration of the spinal root of each fifth nerve, with partial degeneration of the extramedullary portion of at least one fifth nerve; atrophy and changes in the nuclei of the oculomotor nerves, resembling those occurring when the axones are diseased.

These lesions justify the diagnosis of an atypical form of tabes, and the data of importance in the clinical history are: The acquisition of syphilis some years before the appearance of symptoms of nervous disease; attacks of nocturnal incontinence of urine beginning in 1872; a peculiar form of ptosis of the right eye beginning in 1878 or 1879—*i. e.*, a drooping of the right upper lid, which might have been the result of partial paralysis of the levator palpebræ superioris or of loss of the muscular sense in the lid. The lid could be raised voluntarily, but was more comfortable closed—"springing pupils" dating from 1878 or 1879; it is stated that the contraction and dilatation of the pupil in each eye varied from time to time; some weakness of the facial muscles which may have been the result of loss of muscular sense in the face, as it seems that co-ordinated movements, such as whistling, were most affected; difficulty of mastication and of deglutition; atrophy of the tongue, noticed at first on the left side; disturbance of sensation, especially for temperature and pain, and especially on the right side of the face, which seems to suggest that the right-sided ptosis may have been of centripetal rather than centrifugal origin—*i. e.*, from implication of the muscular sense; occasionally griping pains in the abdomen, not due to indiscretion in food or ordinary causes; and neuralgic pains in the lower limbs, these seeming to be the lancinating pains of tabes; a "suspicious grayness" of the optic disk, inequality of the pupils, loss of reaction of the irides to light, loss of power of accommodation, weakness of the right external rectus muscle, failure of vision—all observed by Dr. Jackson in 1888—loss of sexual power.

In addition to these symptoms atrophy of the upper limbs and pain in the ulnar distribution of the right hand developed, the latter expli-

cable by the degeneration of the posterior roots in the lower cervical and upper thoracic regions on the right side.

It is remarkable that this man had no inco-ordination in the movements of the upper limbs, and that he had not is very evident from a specimen of his handwriting. Dr. Cohen says he had no distinct inco-ordination, and was able to write well and clearly and to do work in his carpenter shop up to within a few weeks of his death. The absence of ataxia is explained by the fact that in the cervical region only the lowest posterior roots were degenerated, more especially those on the right side, and even here these roots contained many normal fibres. The degeneration of the posterior roots in the upper thoracic region explains the severe pains extending into the abdomen.

Dr. Cohen, in his paper published eleven years before the death of the patient in 1900, remarked that he believed an irregularly diffuse and slowly progressive degenerative lesion existed, affecting principally the medulla oblongata. The microscopical examination of the tissues shows that this opinion was correct. The slowness in the development of this atypical form of tabes was most extraordinary, for even after the disease had existed many years, presumably at least since 1878 or 1879, the degeneration of the posterior roots was almost confined to the upper thoracic and right lower cervical regions, and was not complete in these portions. The degeneration of the posterior columns was slight, and was partially masked by the presence of normal fibres from lower levels of the spinal cord. The sections are totally unlike those of the ordinary form of tabes, as the columns of Goll are nearly or fully intact.

It is exceedingly important to note that when this case was reported by Dr. Cohen, in 1889, and at a time when the symptoms of the disease were very pronounced, the knee-jerks were well preserved. The explanation is found in the almost complete integrity of the posterior roots of the lumbar region. The knee-jerks in cervical tabes have usually been found absent.

The mentality in Dr. Cohen's patient does not seem to have been fully normal, because it is stated that there was some disposition to repetition of old stories and a forgetfulness of details. Marie[1] has said that in bulbar tabes mental disturbance is not uncommon, and, indeed, it is not very uncommon in the ordinary lumbar form of tabes.

In 1889 co-ordination was said to be perfect, the patient could execute complicated movements with precision, could stand with the eyes closed, and could balance himself on one foot. As Dr. C. K. Mills pointed out at that time, the symptoms were those of bulbar paralysis, but yet the case was unlike one of bulbar paralysis on account of the marked changes in the pain and temperature senses below the neck as

[1] Traité de Méd., vol. vi. p. 415.

well as above it; the involvement of the bladder, bowels, and sexual organs; the general wasting, and the attacks of pain with vasomotor and trophic changes. It is not astonishing that syringomyelia was thought of. The dissociation of sensation, impairment of pain and temperature senses with greater integrity of tactile sense, was like the disturbance of sensation in syringomyelia, and in 1889 syringomyelia was not so well understood as in 1901. We now know that dissociation of sensation may occur in tabes.

The condition known among the Germans as "springing pupils" ("springende Pupillen"), or "springing mydriasis," deserves attention. Koenig[1] says it is of rare occurrence, and comparatively little has been written on the subject. It has been observed in paretic dementia and tabes, and regarded as a bad omen, but is not necessarily so. It has preceded most of the other signs of paretic dementia five or twelve years (Mendel, Hirschberg). It consists of mydriasis affecting first one eye and then the other, and while it may be found in persons without organic nervous diseases, it should at least make the diagnostician guarded in his statements regarding prognosis. Riegel[2] also believes that it is not necessarily a bad sign. In Dr. Cohen's case the sign was very prominent, and was observed among the first manifestations of disease.

I have not found any reported cases of cervical tabes in which the alteration was in the early stages of the disease, as in this case I have studied, and which so far as the spinal cord was concerned was not only a case of tabes superior, but also one of tabes insipiens. The nerve fibres were not all diseased even in those posterior roots that were most altered, and consequently degeneration of the columns of Burdach is not very intense, because normal fibres in these columns are so intimately mingled with the degenerated fibres that sclerosis has not become prominent, and yet the degeneration was not recent, as no evidence of recent alteration was obtained by Marchi's method. For some mysterious reason the disease of the posterior root fibres progressed very slowly, and seems to have been almost arrested for years, as we may judge from the slow progress of the clinical symptoms and the slow death of the posterior root fibres.

A. Stcherbak[3] is correct when he says we must assume that in the early stages of tabes all the root fibres in the various segments of the cord are not equally affected. The case I have examined permits more than an assumption, and shows that there is a very incomplete degeneration of any one posterior root. It is because of this fact that there are many variations of the clinical phenomena; possibly the fibres con-

[1] Deutsch Zeitschrift für Nervenheilkunde, vol. xv., Nos. 1 and 2, p. 122.
[2] Ibid., vol. xvii., Nos. 1 and 2, p. 169.
[3] Neurologisches Centralblatt, 1900, No. 23.

ducting the sensory impressions from the skin may be first affected or those from deeper structures, so that in the early stages of tabes there may be disturbance of the cutaneous sensation alone, or loss of the deep sensation without disturbance of cutaneous sensation, or ataxia without disturbance of sensation.

The cases of cervical tabes with necropsy, so far as I have been able to collect them from the literature, are those of Leyden, Dejerine, Martius, Eichhorst, Marinesco, Redlich, and probably those of Mayer and Vucetie. The name of tabes cervicalis seems to have been first employed by the elder Remak for that form of tabes in which the upper limbs are chiefly implicated. It is a very rare type of the disease, and in 106 cases of tabes studied at the Bicêtre, Dejerine[1] observed it only once. It is known also as tabes superior, and on account of its resemblance clinically to syringomyelia Marie[2] warns us to be careful in the differential diagnosis. Very few cases have been reported in the literature, and if we include only those with necropsy the number is exceedingly small. The only cases of tabes cervicalis referred to by Leyden and Goldscheider,[3] in their recent work in the Nothnagel system of monographs, are those of Leyden, Martius, Dejerine, and Redlich. Redlich,[4] in his monograph on tabes, in which we should expect to find the literature fully given, refers to the cases of Leyden, Martius, Eichhorst, Dejerine, Vucetie, Marie, Mayer, and Marinesco. In an earlier paper on tabes, Redlich[5] described a case of cervical tabes, and in his monograph already referred to he describes another. It is desirable to collect these cases of cervical tabes so far as possible, and to compare the symptomatology. In the few that are reported with necropsy the degeneration of the posterior roots does not seem to have been confined to the cervical region, so that in a strict sense tabes cervicalis is a misnomer, but it has been long in use and the predominance of the symptoms is the result of cervical implication, and it is therefore likely that the term will not be abandoned.

In 1876, in his "Klinik der Rückenmarkskrankheiten," Leyden[6] said: "In rare cases the disease begins in the upper limbs; the pains and sensory disturbances are felt here first, and remain most severe here. The lower limbs during the entire course of the disease are not much affected. A case of this kind was described by Gull, and I have recently observed a similar one. The recognition of a case of this character is more difficult because the ataxia is not so prominent. . . . In other cases the symptoms indicate an implication first, or at least chiefly, of

[1] Sémiologie du Système Nerveux. Traité de Path. Gén., vol. v. p, 650.
[2] Vorlesungen über die krankheiten des Rückenmarkes, translated from the French, p. 325.
[3] Nothnagel's Specielle Pathologie und Therapie, vol. x. p. 508.
[4] Die Pathologie der tabischen Hinterstrangserkrankung, 1897.
[5] Obersteiner's Arbeiten, 1892, vol. i. p. 26.
[6] Klinik der Ruckenmarkskrankheiten, zweite Band, zweite Abtheilung, p. 350.

the upper portion of the spinal cord; the pains in the head, face, and neck are severe, the ocular symptoms develop early, and the pains of the lower extremities diminish and ataxia does not develop until late." The findings in Leyden's case, to which Leyden[1] refers briefly in the above quotation, he said later were very similar to those in Martius' case. The columns of Burdach were the ones chiefly degenerated, while those of Goll were very slightly affected. Leyden, in 1888, said that his own case and Martius' were the only cases of tabes cervicalis with microscopical examination of the spinal cord on record. It will be seen from this that accurate knowledge concerning the symptomatology and pathology of tabes cervicalis dates from 1876, and yet in the past twenty-five years very few cases with necropsy have been reported. I have not been able to obtain the papers containing the reports of the cases of Mayer and Vucetie.

In 1888 four cases of cervical tabes, two of which were with necropsy, were published. They were those of Weir Mitchell, Dejerine, Martius, and Bernhardt. Weir Mitchell[2] described a case of cervical tabes without necrospy in which the knee-jerks were excessive on each side.

In Dejerine's[3] case of superior tabes the disease began with impairment of vision and diplopia. Both optic nerves became atrophied and myosis was present. Lancinating pains were felt in the upper limbs and in the back part of the head and in the trunk and thighs. The movements of the upper limbs became so impaired from ataxia that the man had little use of those parts. Walking was difficult, simply because he could not see well, but the movements of the lower limbs were not ataxic. Tactile and pain senses, but not temperature sense, were much retarded in the upper limbs and face, and less so in the trunk. Sensation was almost normal in the lower limbs. The muscular sense was lost in the upper limbs, but preserved in the lower limbs. The olecranon reflex was lost, but the patellar reflex was preserved in the adductors of the thighs, although the jerk of the knee was absent. Romberg's sign was not present. Taste, smell, and hearing were preserved. No visceral disturbances existed. The cerebrum and cerebellum were found to be normal, the posterior roots were much degenerated in almost the entire cervical region and upper part of the thoracic region, and very slightly so in the lumbar region. Slight posterior leptomeningitis existed. The anterior roots were normal. The spinal root of the fifth nerve was much degenerated on each side. Both sixth nerves were degenerated. The posterior columns were much degenerated in the cervical region, less so in the mid-thoracic region, and very slightly so in the lumbar region. Slight alteration of Clarke's

[1] Deutsch med. Wochenschrift, 1888, vol. xiv., No. 9, p. 164.
[2] Medical News, April 21, 1888.
[3] Archives de Physiologie, 1888, 4 Série, Tome i. p. 331.

column was observed. The anterior part of the spinal cord and the nuclei of the cranial nerves were normal.

In the case of cervical tabes reported by Martius the disease began with paræsthesia in the upper limbs, especially in the hands and fingers, and later similar paræsthesia was experienced in the lower limbs, with weakness of those parts. Ataxia could not be detected. The man was unable to distinguish objects by touch when his eyes were closed, and he had some disturbance of pressure and temperature senses. Romberg's sign, Argyll-Robertson's sign, and Westphal's sign were absent; indeed, the knee-jerk was easily obtained on each side and without reinforcement. Still later girdle sensation was felt. The patient died from pneumonia in the same year that his symptoms were studied, but during the pneumonia reflex rigidity of the iris was detected. The knee-jerk was present until death. The degeneration of the posterior columns was most intense in the cervical region, and was very slight in the lumbar region, and Westphal's root entrance zone was fully intact.[1]

Bernhardt's[2] case of cervical tabes was without necropsy. The knee-jerks were absent and the ataxia was very pronounced in the upper limbs but not in the lower.

In Eichhorst's[3] case the posterior columns were degenerated in the cervical and upper two-thirds of the thoracic region. The posterior columns in the lower third of the thoracic region and in the lumbar and sacral portions were not affected, and yet the knee-jerks were lost. Leyden believed that loss of the patellar reflex might occur in tabes from neuritis, but Eichhorst was the first to actually demonstrate in the report of this case that the loss may be so produced. He found intense neuritis of the crural nerves. It is interesting to know that while in this case the posterior roots of the lumbar region were not degenerated, the more peripheral parts of these neurons were greatly altered.

In the case of superior tabes reported by Marinesco the degeneration in the columns of Burdach was distinct at the third cervical segment, and on one side the posterior roots were degenerated as high as this level. The degeneration of the posterior roots extended downward as far as the seventh thoracic segment. The posterior roots were not altered in the lumbar region, but in the cervical the degeneration of the columns of Burdach was intense, much more so than in the case I have studied. The patient had had ocular palsies, impairment of vision, pain in the right shoulder, partial paralysis of the right upper limb with anæsthesia and analgesia of this limb extending to the thorax on the same side, masque tabétique (Charcot), and loss of sensation in the conjunctiva and cornea. There was no disturbance of the muscular sense. The patellar reflex was preserved. The pupils were equal, somewhat con-

[1] Deutsch med. Woch., 1888, No. 14, p. 163.
[2] Zeitschrift für klin. Med., 1888.
[3] Virchow's Archiv, 1891, vol. cxxv. p. 25.

tracted, and the irides did not react to light or accommodation. The visual fields were contracted. The oculomotor nerve was paralyzed on each side. The bulb does not appear to have been examined. In the atlas in which this case is published Marinesco[1] gives a picture of a section from the cervical cord from another case of cervical tabes, and in this case the tabetic degeneration was in an early stage.

In both the cases reported by Redlich[2] the degeneration of the posterior roots was not confined to the cervical region. In his second case the "local tabetic degeneration"—by which he refers to the degeneration of the posterior roots at their entrance into the spinal cord—began in the upper part of the thoracic cord and extended as high as the upper cervical region.

In the case diagnosticated as one of cervical tabes by de Buck,[3] weakness, ataxia, lancinating pains, and objective disturbances of sensation were present in the upper limbs. The gait was slightly ataxic and Romberg's sign was present. The Achilles reflex was absent on each side, but the patellar reflex was exaggerated on each side. I am not aware that any case of cervical tabes with exaggerated knee-jerks and necropsy has ever been reported, so that we are in complete ignorance of the cause of this exaggeration. De Buck's case was merely a clinical one.

It is not to be supposed that I have included all the clinical cases of cervical tabes. Some are alluded to in a cursory manner. Mott,[4] for instance, refers to one of his cases in which the cervical tabes began in the upper limbs of a mounted policeman, and infers that the greater use of the upper limbs was the cause of this unusual involvement.

Dr. Cohen's case was one of bulbar tabes as well as one of cervical tabes. Bulbar disturbances as a part of the tabetic symptom-complex are not common, although paralysis of the ocular muscles, either transitory or persistent, has been observed not infrequently. Leyden and Goldscheider[5] have found that paralysis of the external ocular muscles occurs in about 40 to 50 per cent. of the cases of tabes, and that paralysis of the external rectus is the most common of these. In Dr. Cohen's case there was distinct paresis of the right external rectus and partial degeneration of the extramedullary portion of the right sixth root near the medulla oblongata. Paralysis of the facial or of the motor portion of the trigeminus is rare, although Peterson and Schultze have each reported a case of paralysis and atrophy of the muscles of mastication in tabes. Leyden,[6] in 1876, said that unilateral facial paralysis

[1] Atlas der Pathologischen Histologie des Nervensystems. Victor Babes. v. Lieferung, 1896.
[2] Die Pathologie der tabischen Hinterstrangserkrankung, 1897. Obersteiner's Arbeiten, 1892. vol. i. p. 26.
[3] Journal de Neurologie, June 20, 1899, No. 13, p. 241.
[4] Lancet, July 14, 1900, p. 87.
[5] Nothnagel's specielle Pathologie und Therapie, vol. x. p. 532.
[6] Klinik der Ruckenmarkskranheiten, zweite Band, p. 344.

sometimes occurs in tabes, but is incomplete and transitory. Hirt[1] regarded facial palsy as such a rare sign of tabes that when it occurs he thought one should consider carefully whether it were not a complication. He observed it in only two out of 345 cases of tabes. Chvostek,[2] in reporting a case of tabes with sensory and motor disturbances in the distribution of the trifacial nerve, difficulty in deglutition, palsies of external ocular muscles, and paralysis of the right facial nerve in the lower part of its distribution, refers in refutation of Hirt's opinion to the cases of Fournier, Kahler, Semon, Dejerine, Peterson, Jeoffroy-Hanot, and Ehrenberg.

In all three of the cases of tabes with bulbar symptoms reported by Cassirer and Schiff disturbances in the lower distribution of the facial nerve were observed, but there were no central changes to explain these symptoms.

In Peterson's case of tabes the weakness and atrophy of the masseter and temporal muscles were pronounced, and in eating the man had to support and assist the lower jaw with his hands. The two pterygoids on each side were paretic. There was no anæsthesia of the face. The left side of the face was a little paretic, the action of the occipitofrontalis was stronger and the nasolabial fold deeper on the right than on the left side.[3]

The facial implication seems, therefore, to have been slight. In Dr. Cohen's case the findings in the seventh nerves and their centres do not afford a satisfactory explanation of the facial paresis, and it is possible that it was the result of disturbed muscular sense from degeneration of the fifth nerves.

Hemiatrophy of the tongue in tabes seems to have been first observed by Charcot and later by G. Ballet. When Koch and P. Marie[4] reported their case they could find only five other cases of hemiatrophy of the tongue occurring in tabes, and only two others with microscopical examination (Raymond and Artaud, Westphal, Koch and Marie). In these three cases the twelfth nucleus on the side corresponding to the atrophied side of the tongue was degenerated. Marie later refers to a case with necropsy reported by Mathias Duval. Cassirer and Schiff refer only to the cases of Raymond and Artaud, Koch and Marie, Westphal, and Eisenlohr, as cases of tabes in which either unilateral or bilateral degeneration of the nucleus of the hypoglossal nerve had occurred, and in all these cases except Eisenlohr's the atrophy of the hypoglossal nucleus was unilateral. In a case of tabes reported by Cassirer and Schiff the hypoglossal nuclei in the greater portion of their extent were normal,

[1] Pathologie und Therapie der Nervenkrankheiten, second edition, p. 529.
[2] Neurologisches Centralblatt, 1893, No. 12, p. 762
[3] Journal of Nervous and Mental Disease, 1890, vol. xvii. p. 450.
[4] Revue de Médecine, 1888, vol. viii. Vorlesungen über die Krankheiten des Rückenmarkes, p. 283.

but in the distal portion of the nucleus on the side corresponding to the atrophy of the tongue there was a very slight diminution in the number and size of the nerve cell bodies. They regarded this alteration as insufficient to explain the atrophy of the tongue, and they believed the atrophy of the tongue was produced by degeneration of the hypoglossal nerve. In the case I have examined the hypoglossal nucleus in its inferior portion on the side corresponding to the half of the tongue at first most atrophied was much smaller than the corresponding nucleus of the other side, and Cassirer and Schiff's observation may have more importance than they attribute to it.

It is my belief that if the medulla oblongata were studied more frequently in cases of tabes, degeneration of the spinal root of the trigeminal nerve would not be a very rare finding. I have seen it in a number of cases of tabes. According to Cassirer and Schiff, the degeneration of this root was first detected by Westphal in 1864, and later by Oppenheim and Siemerling, Hayem, Flechsig, Vulpian, and others. Cassirer and Schiff found the spinal root of the trigeminus degenerated in three cases of tabes, and in one of these the degeneration was unilateral. They point out that in some cases the root was more degenerated in its inferior than in its superior portion (Oppenheim and Siemerling, Eisenlohr, Zeri), and that in others the dorsal part of the root or the ventral part was most degenerated. In the case I have studied as well as in those of Cassirer and Schiff the glia cells seemed to be more numerous in the degenerated spinal roots. In their cases the sensory nucleus of the trigeminal nerve was perfectly normal, as it was at least on one side in my sections, although in cases reported by others it has been found degenerated. The sensory disturbances in the face that have been observed in cases in which the spinal root of the fifth nerve was found degenerated were not always the same, but Cassirer and Schiff say that in their cases sensory disturbances were always present in the face when the spinal root was greatly degenerated, although a parallelism between the clinical signs and the pathological findings was not present. We shall probably not err if we attribute to the degeneration of the spinal root of each fifth nerve, in Dr. Cohen's patient, the disturbance of sensation in the face, possibly the loss of taste on the anterior portion of the tongue, and even at least some of the motor bulbar symptoms, explaining these as a result of loss of sensory impulses.

In one of his cases of tabes, Oppenheim[1] says paræsthesia and disturbance of function were observed in the distribution of the fifth nerve. The patient's face felt stiff, and he had paræsthesia in the mouth and tongue and difficulty in chewing and swallowing, and yet this difficulty was not caused by disturbance of motor nerves or, at most, very slightly

[1] Arch. für Psychiatrie, 1868, vol. xx. p. 131.

so, as the muscles of mastication were powerful and paresis of the soft palate was very slight. Ataxia of the muscles of the face and tongue and of mastication became so great that when the patient attempted to speak he showed great contortion of the face. All these disturbances were probably the result of alteration of the fifth nerve. In another case in which implication of the fifth nerve existed, chewing and swallowing were difficult, the patient did not know whether any food were in her mouth, and she could extend the tongue properly only when she watched the movements of the tongue in a looking-glass. In both these cases the spinal root of the fifth nerve was degenerated on each side.

Oppenheim[1] says that Duchenne spoke of implication of the fifth nerve in tabes. He also says that the symptoms attributed to degeneration of the spinal root of the fifth nerve have varied considerably in different cases.

The constant biting of the cheeks, for the relief of which in 1886 Dr. Cohen's patient had several teeth extracted, and the absence of pain upon their removal, as well as the loss of food in the mouth, were probably the result of degeneration of the spinal roots of the fifth nerves.

The descending root of the vago-glossopharyngeus is occasionally found degenerated in tabes. Cassirer and Schiff collected twelve cases in which degeneration of this bundle was observed, but only in six of these was the microscopical examination thorough. The absence of disturbance of taste in these six thoroughly studied cases seems to show that integrity of the solitary bundle is not necessary for the function of taste. Disturbances of the functions of the larynx observed in these six cases were not necessarily the result of degeneration of the solitary bundle, because there was also degeneration of the bulbar nuclei or of the peripheral portions of the vagus and glossopharyngeus nerves. In one of the twelve cases the solitary bundle was degenerated, but clinical signs indicative of this degeneration had not been observed. Cassirer and Schiff conclude that the solitary bundle has no relation to the function of taste, or of sensation or motion in the larynx, or to deglutition. The degeneration of this bundle has no relation to gastric crises or disturbances of respiration. Cassirer and Schiff found the large fibres in the solitary bundle degenerated, while the fine fibres were preserved and formed a group on the dorso-median portion of the bundle. In Schlesinger's[2] case both descending glossopharyngeal roots were degenerated, and, according to Schlesinger, the degeneration of these roots has been found in tabes especially when laryngeal disturbances had been present, and yet he merely calls attention to the frequency of the association without expressing himself very positively in regard to the importance of it. It seems from his investigations, also, that degeneration of these roots does not cause disturbance of taste.

[1] Wiener klin. Wochen., 1894, No. 27, p. 497.

It is possible, however, that the feeble and irregular cardiac action in Dr. Cohen's patient was the result of the degeneration of the descending root of the left vago-glossopharyngeus.

The dorsal nucleus of the vagus has been found degenerated in tabes, and was so in one of Cassirer and Schiff 's cases, but these authors were unable to observe positive degeneration of the nucleus ambiguus, and I also have been unable so to do in the sections studied by me.

Cases of bulbar tabes with necropsy are very rare, and v. Reusz,[1] in publishing a case of this kind, says only two other such cases have been reported since the appearance of the paper by Cassirer and Schiff, viz., a case by Grabower and Oppenheim and one by Zeri, but the case by Zeri is probably referred to by Cassirer and Schiff.

SOME OBSERVATIONS ON TYPHOID FEVER COMPLICATED BY CROUPOUS PNEUMONIA, WITH REPORTS OF FOUR FATAL CASES.

By Henry M. Fisher, M.D.,
of Philadelphia.

Many text-books do not even mention croupous pneumonia as a complication of typhoid fever.

As Niemeyer says,[2] it can easily be overlooked in the same way as the pleurisy with effusion that also occasionally occurs as a complication of typhoid, and it, like the latter, is often unattended either with pain, chill, or increased fever.

That it is not a very unusual complication is shown by the study of Liebermeister's[3] cases in the epidemic of typhoid fever at Basle, 1865–1868, when consolidation of the lungs, not due to hypostatic congestion, was noted fifty-two times among 1420 cases, giving a percentage of the complication of 3.6. That it is a very serious complication is shown by the fact that of these fifty-two cases reported by Liebermeister[4] and Betke,[5] twenty-nine died, showing a mortality, therefore, of 55.7 per cent. Gallisart de Marignac[6] reports thirteen cases with only three recoveries, a mortality for the complication, therefore, of 77 per cent.

Other French observers, as L. Girard,[7] Castex,[8] and G. Destaix,[9] all report a number of cases with a low percentage of mortality. I think,

[1] Archiv f. Psychiatrie, 1899, vol. xxxii., No. 2, p. 535.
[2] Lehrbuch der speciellen Pathologie und Therapie.
[3] Ziemssen's Cyclopædia. [4] Loc. cit.
[5] Die Complicationen des Abdominal Typhus. Berlin, 1870.
[6] Pneumonie lobaire. Survenant dans le cours de la Fièvre Typhoïde. Paris, 1877.
[7] De la fièvre typhoïde a début pneumatique. Paris, 1882.
[8] Contribution à l'etude des accidents pulmonaires de la fièvre typhoïde. Paris, 1879.
[9] Considerations sur quelques accidents pulmonaires, et sur la pneumonie pseudolombaire en particulier, survenant dans le cours de la fièvre typhoïde.

however, that this low mortality must have occurred in an epidemic of an unusually mild type. When we consider the extreme prostration of patients in the second, and particularly the third, week of a severe attack of typhoid fever, an involvement of any large area of their lungs by the pneumonic process can hardly fail to increase very much the gravity of the prognosis.

The etiology of the complication is an interesting one.

It seems probable that in many cases the pneumonia is due to a mixed infection. In fact, both typhoid bacilli and pneumococci have been recovered from the lungs of patients who have died of pneumotyphus. In other cases it seems reasonable to believe that the pneumonia is purely septic. Such are the cases where a pneumonia develops with great rapidity and with fulminating symptoms, perhaps late in the course of the typhoid fever, and is rapidly fatal. One such case occurred during my late service at the Episcopal Hospital, the fourth on my list. This developed in a boy who, after several weeks of fever of rather an indefinite type, suffered from an acute otitis media. Two or three days later his lungs, which had been clear before, rapidly filled up, and he died within twenty-four hours after the first signs of pulmonary congestion. Unfortunately, in this case cultures were not made from the lungs. The intestines showed apparently recently healed typhoid ulcers.

Dr. D. Betke's[1] observation would seem to show that the complication has been more frequent since the cold bath treatment has been in vogue than before, but that the mortality from the complication since the treatment has been instituted has been considerably less. While it may be difficult or impossible to make the diagnosis of typhoid fever when pneumonia occurs, as it sometimes does in the various stages of typhoid fever and masks the symptoms of the latter, a high degree of leucocytosis occurring in the second or third week of typhoid fever ought to make us suspect the occurrence of this complication.

As Destaix[2] observes, the normal leucocytosis of the first week of typhoid fever diminishes rapidly in uncomplicated cases after the seventh day of the disease. Often, too, but by no means invariably, the onset of the croupous pneumonia is announced by a marked rise in the temperature and an increase in the respiration rate. The sharp pain in the side and the rusty sputa are seldom observed.

In the following case the diagnosis was unfortunately not made, the pulmonary symptoms having been, perhaps, unusually pronounced. The marked abdominal pain and tenderness were supposed to have been caused by a rapidly developing tubercular peritonitis.

[1] Loc. cit.

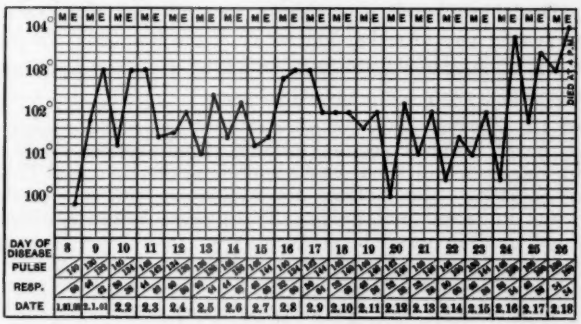
[2] Considerations sur quelques accidents pulmonaires survenant dans le cours de la fièvre typhoïde. Paris, 1877.

It will be observed in this case that while there was a distinct leucocytosis noted on the third day after her admission, on only one occasion, three days before death, was a weak positive Widal reaction noted.

CASE I.—Jennie R., aged sixteen years, was admitted to the Episcopal Hospital under my care on January 31, 1901. Notes by Drs. Steel and Francis Sinkler.

Two years ago the patient was in the hospital with nervous prostration. One week before admission she was seized with a sudden pain in the right side, accompanied by a chill and fever. Cough began three days ago, unaccompanied by expectoration. Upon admission she complained of muscular pains, shortness of breath, and cough. Her bowels were opened three times on the day of her admission. Complete anorexia and insomnia. Temperature on admission was 99.4°. Breathing labored and rapid; face flushed, extremities cold. Friction sounds heard all over right chest except at apex, and mucous râles over base posteriorly, and tubular breathing heard over a limited area of the left lower lobe posteriorly, and mucous râles over upper lobe. Abdomen negative. Urine shows a faint trace of albumin, but no casts.

CHART 1.



February 1*st*. Condition fair. Leucocytes 17,800.

2*d*. Rigidity and extreme tenderness of the whole abdomen, with slight tympanites. Pulse weaker.

4*th*. Tubular breathing and crepitant râles over whole left lung.

5*th*. Widal reaction negative.

6*th*. Urine shows a faint trace of albumin, one granular cast, granular epithelium, and chains of bacteria.

9*th*. Widal reaction still negative; less cough. Abdomen tympanitic and very sensitive to the touch. No spots. Pulse rapid and slightly irregular Breathing rapid and entirely costal. Two loose stools.

11*th*. Leucocytes, 9000. Oxygen administered last night; improved pulse and respiration temporarily, though latter still much labored.

13*th*. Widal reaction still negative. Leucocytes, 6200.

16*th*. Weak positive Widal. Slight leucocytosis.

18*th*. Widal negative; no leucocytosis; patient weaker; respiration shallow.

19*th*. Patient died at 6.30 A.M.

Autopsy revealed bed-sore over sacrum. Abdomen full of foul-smelling pus, partly free and partly in abscess lying between and around the organs. Pelvis contained about one pint of pus. Mesenteric glands enlarged.

Intestines. Ileum shows ulcerated Peyer's patches. There is one perforation at the hepatic flexure of the colon and another about three inches above the sigmoid flexure. Both perforations are at the seat of ulcerated Peyer's patches.

Liver enlarged and shows fatty degeneration.

Spleen large and soft. Pulp semi-liquid.

Kidneys. Right: atrophic, of the size of the last joint of the thumb. Left: about twice the normal size; no pathological change.

Thorax. Visceral pleura adherent to parietal over entire surface except at base of chest. Half a pint of sanguino-purulent fluid in upper surface of diaphragm. Hepatization of lower lobes of both lungs.

Heart. Pericardium not inflamed; no increase of normal fluid; mitral valve showed vegetations on each leaflet.

In the following case congestion of the lungs was noted eight days after admission or probably toward the end of the second week of the fever. Distinct evidences of pneumonia were not, however, found until the twenty-first day after her admission to the hospital. In this case the attack of pneumonia was ushered in by a distinct chill, and the patient had also rusty sputa and dyspnœa.

CASE II. *Typhoid fever, complicated by croupous pneumonia* (from hospital record of Dr. Steel).—Amelia P., aged nineteen years, single, born in England, mill hand, was admitted to the Episcopal Hospital, January 3, 1900. Has suffered from chlorosis, with a good deal of gastric and intestinal indigestion. Three weeks before her admission to the hospital she was obliged to stop work on account of weakness, vertigo, and headache. No epistaxis or diarrhœa, but insomnia.

On admission her temperature was 103.2°. She was pale, but appeared fairly well nourished. Her conjunctivæ slightly jaundiced; her cheeks flushed; her tongue coated, but red at the tip and edges; slight prolongation of the expiratory murmur at the right apex; a soft systolic apex murmur. Her abdomen was slightly tympanitic, and there was tenderness in both iliac fossæ. No rose spots. Splenic dulness extends upward to the seventh space. Liver dulness normal.

Blood Examination. Widal, negative; hyperleucocytosis, 10,000; red blood-corpuscles, 4,608,000; hæmoglobin, 60 per cent.; index, 65.2 per cent.

Urine. Specific gravity, 1014; acid; no albumin; no glucose; no casts; epithelium and leucocytes.

January 7th. Blood shows a positive Widal reaction to-day.

9th. Stools light, partly formed. Crops of rose spots developed to-day. Spleen palpable on deep inspiration.

11th. Hard cough for past twenty-four hours. Lungs show considerable congestion posteriorly. General condition good.

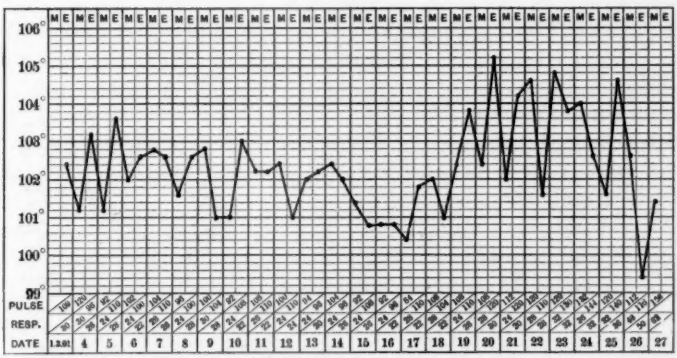
14th. Diminished resonance with sibilant râles all over left lung. Complains of constant headache. Red blood-corpuscles, 4,728,000; hæmoglobin, 65 per cent.; index, 70 per cent.

22*d*. Cough not so severe and looks decidedly better. Lungs still full of sibilant râles. As the cold sponges fail to reduce temperature, this afternoon at 7, patient's temperature being 104°, she received a plunge bath, and her temperature fell to 101.6°. There was a little shivering after the bath. On the 23d she had three plunge baths, her temperature having risen to 104.8°. At 4 P.M. she had a distinct chill.

24*th*. Patient's temperature rose to 105° to-day, and she was slightly delirious. Baths stopped. Bases of lungs more congested, and there is a distinct area of tubular breathing just below and to the inner side of the lower angle of the left scapula; sputum rusty. She had another chill last night.

25*th*. Temperature rose at 4 A.M. to 105.5°. This morning tubular breathing is heard over a more extended area of the left lung. Dyspnœa has increased, and at 4 P.M. her respirations were 40 in the minute. Examination of the blood shows a marked leucocytosis. Urine shows a distinct trace of albumin, but no casts.

CHART 2.



26*th*. At 7 this morning patient's pulse was 148, and her respiration 40. This afternoon at 4 o'clock her pulse had dropped to 116 and her temperature to 101.5°. There were signs of consolidation of the whole upper lobe of the left lung and of the upper two-thirds of the lower lobe. Bowels loose, and again of the "pea-soup" character. At about 5 o'clock in the afternoon there had been rather a sudden marked change for the worse. Her pulse was very weak—160 to 180—and she was in a state bordering on collapse. My resident, Dr. Steel, exposed the median basilic vein and injected about one pint of hot normal salt solution, but during the operation dyspnœa increased and her color became livid. Immediately afterward strychnine, grain one-twentieth; nitroglycerin, grain one-fiftieth, and whiskey, twenty minims, were injected hypodermically, and this injection was repeated in about an hour. The injections and salt solution appeared to give slight temporary relief, but in spite of very free stimulation no marked improvement occurred. She died at 6 o'clock in the morning.

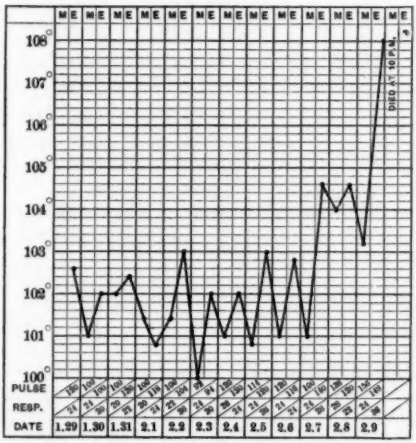
27*th*. In reference to the clinical notes I see that the patient had

been receiving strychnine sulphate, grain one-sixtieth to one-fortieth, and ammonium carbonate, grains ten, every alternate four hours since January 21st; also whiskey in half-ounce doses every three hours, and on the 23d or 24th she was also given tincture of musk in twenty minim doses every three hours. No autopsy was permitted.

In the next case the occurrence of rather a high degree of leucocytosis—45,300—on the tenth day after the patient's admission, or probably toward the end of the third week, coincidently with the physical signs of pneumonia and marked rise in temperature, was interesting. It is to be regretted that an autopsy could not be secured.

CASE III.—Edward M., aged sixteen years, was admitted to the Episcopal Hospital under Dr. D. J. Milton Miller's care, January 29, 1901. Notes by Dr. Ziegler. Patient had been ill for seventeen days and confined to bed for a week. No epistaxis and no cough, but some diarrhœa. Constant headache and occasional delirium. Face flushed and has a listless expression. Lungs clear, heart negative. Spleen

CHART 3.



somewhat involved. Abdomen moderately distended and tympanitic, and numerous rose spots on its surface. A good deal of hebetude, and at times somewhat delirious. Both buttocks are reddened and excoriated, and over the right great trochanter there is a small area of superficial ulceration. Urine shows a decided trace of albumin, but no casts. Diazo-reaction present. Widal positive. Leucocytosis absent.

January 31st. Has had small doses of morphine for the last two nights to give him rest. This has been effectual, though he moans a good deal in his sleep. Is very delirious. Bowels very loose, and stools thin and yellowish and passed involuntarily.

February 2d. Noisy at night; involuntary passage of urine and feces. Bed-sore on his back.

5th. Low muttering delirium. Did not react well to plunge. Trional and chloral were given to secure sleep. He slept after this, but moaned and talked in his sleep. Peripheral circulation weak.

6th. Condition improved. Plunges were given at temperature of 90°.

7th. Suggestion of tubular breathing; no other change observed, except some dyspnœa.

8th. Still noisy at night and sleep disturbed. Restless also during the day; very nervous. Reflexes increased; ankle-clonus present. Complains of pain in his head. Leucocytes, 45,300.

9th. Pulmonary second sound accentuated. Right heart dilated, right border extending to right border of sternum. Upper border of heart dulness begins at third rib. Liver dulness stops two inches above the central margin in mid-clavicular line. Whole left chest from spine of scapula down is dull on percussion. Tubular breathing over whole lower lobe. About 11 o'clock face and hands became cyanosed. Respiration and heart's action much embarrassed. Radial pulse scarcely perceptible. Under influence of oxygen and hypodermic of camphor condition improved, and patient broke out into a heavy sweat. Continued to perspire all day, and he seemed somewhat better during the afternoon. At about 7.30 P.M. he grew rapidly weaker and died at 8.30 P.M. Temperature before death rose to 108°.

In the following case the absence of positive symptoms of typhoid fever while the patient was at the hospital, and the absence of a marked Widal reaction at any time, would have rendered the diagnosis doubtful. The post-mortem findings appeared, however, to show pretty conclusively that the patient was convalescing from that disease, and I have, therefore, felt justified in including the case in my list.

CASE IV.—H. C. G., aged six years, colored, was admitted to the Episcopal Hospital on January 19, 1901. Patient had been ill for three weeks, complaining of pain in chest and abdomen, and had vomited almost all his food for the past ten days. His bowels were constipated. He had been very drowsy. Had had severe epistaxis for three days. Temperature on admission 104°. His tongue was heavily coated, the mucous membrane of his pharynx much congested, and his tonsils were swollen. A few moist râles were heard over the bases of both lungs. The apex-beat of his heart was in the sixth space within the nipple line, and a soft systolic murmur was heard over the body of the heart. There was tenderness in both iliac fossæ. Liver and splenic dulness normal; no rose spots. Stools frequent, loose, dark brown, and contained some greenish flakes and curds.

January 22d. Had severe nose-bleed last night, losing three to four ounces of blood. Widal reaction negative. No leucocytosis.

27th. Widal still negative. Apparently slight leucocytosis. Urine normal.

30th. Temperature has been normal or subnormal at times during the past two days, with slight febrile exacerbations. Stools dark and partly formed.

February 4th. Leucocytes, 20,000. Heart and lungs negative. No abdominal symptoms. Throat tender externally. Severe epistaxis

occurred several times, and it became necessary to pack the nasal cavities.

6*th*. Thin, clear discharge appeared from the right ear this morning. Had complained of pain in this ear for twenty-four hours previously.

7*th*. Ear still discharging profusely. Abdomen and chest negative.

8*th*. Complained this morning of intense pain in the left ear. Vomited milk once to-day.

9*th*. Still complains of ear, and also this morning for the first time of severe pain in chest. His temperature at 1 o'clock rose to 105.5° and his respiration to 40. Fine moist râles were heard over both lungs, and tubular breathing heard over the whole of the lower lobe of the right lung. Abdomen rigid and tender. Pulse became rapidly weaker, and he died at 8.45 on the morning of February 10th.

Autopsy. Both pleural cavities contain about one pint each of clear serum; the right also some lymph flocculi. The right lung was the seat of croupous pneumonia, involving the lower lobe of the apex of the upper lobe anteriorly. Plastic lymph on visceral pleura over consolidated area, and there was a gelatinous puriform collection anteriorly between the lobes.

Pericardial cavity contained a normal amount of clear serum, but there were numerous bright-red petechial spots in the visceral layers of the pericardium and on the outer surface of the heart.

Liver shows cloudy swelling.

Spleen firm and not much swollen.

Kidneys show cloudy swelling.

Intestines. Peyer's patches swollen, some resembling typhoid ulcers at an early stage of the disease, and others presenting the appearances commonly seen in the seventh, eighth, or ninth weeks after typhoid. The mesenteric glands and solitary follicles were also considerably enlarged.

Brain weighed forty-nine and one-quarter ounces, and there was a small subdural hemorrhage over the median fissure in the parietal region

REVIEWS.

A System of Physiologic Therapeutics. A Practical Exposition of the Methods Other than Drug-giving Useful in the Treatment of the Sick. Edited by Solomon Solis Cohen, A.M., M.D., Professor of Medicine and Therapeutics in the Philadelphia Polyclinic; Lecturer on Clinical Medicine at the Jefferson Medical College, etc. Vols. I. and II., Electrotherapy, by George W. Jacoby, M.D., Consulting Neurologist to the German Hospital, New York City; to the Infirmary for Women and Children, etc. In two books. Book I., Electrophysics. Book II., Diagnosis, Therapeutics. Illustrated. Philadelphia: P. Blakiston's Son & Co.

In bringing out the first system bearing upon the therapeutical measures other than the administration of drugs which are at the command of the physician, the editor has coined a most expressive title, "Physiologic Therapeutics," which is to be commended as expressing much in few words. Dr. Cohen has prefaced the series with an interesting "Foreword," written in the philosophical manner so characteristic of its author, and detailing the plan to be pursued in the issuance of the work. We think he has done wisely in "preferring compact books by single writers to bulky tomes of composite authorship." Dr. Johnson said that the books one could hold in one's hand were the best, and there is no doubt that ease of handling renders a book more apt to be consulted. It is a pity that the volumes, however, were not made of lighter material, as they are of considerable weight for the amount of matter they contain.

The first two volumes are by Dr. George W. Jacoby, of New York, and deal with that most interesting and complex subject, electrotherapy. Dr. Jacoby begins with a very lucid and concise exposition of the principles of electrophysics. The reviewer knows from practical experience as a teacher how little the average medical student knows concerning the elemental laws of electricity, and how hard it is to attempt to teach him its therapeutical applications unless he possesses some knowledge previously acquired. Dr. Jacoby's book is, of course, unsuitable for use by the student, but it will prove of the greatest value to the teacher as a guide in his work of instruction. Dr. Jacoby does not fill up his pages with discussions of theories and problems, but gives a description of the various ways of obtaining electricity, the varieties of electrical apparatus, and the physical results produced by the different methods of applying the current.

In the second volume the physiological effects of the electrical current on the different organs and tissues of the body are first considered, followed by a section devoted to the principles of electrodiagnosis and electroprognosis in diseases of the motor and sensory apparatus. The rest of the book is devoted to the direct application of our knowledge

of electricity to the treatment of pathological conditions, including chapters on its surgical uses, by John Chalmers Da Costa; its use in ophthalmology, by Edward Jackson; in diseases of the nose, throat, and ear, by W. Scheppegrell; in gynecology, by F. H. Martin, and in dermatology, by Ohmann-Dumesnil. X-ray therapy is considered in all its most recent aspects.

These two volumes form a most complete, accurate, and up-to-date presentation of electrical science in its relation to medicine, and as such must possess the greatest value to all medical men, whether they have electrical appliances or not. No physician can afford to ignore the vast and constantly increasing part which electricity is taking in the study and treatment of disease, and in these books the sum of our knowledge is readily obtainable in an interesting manner. F. R. P.

ESSENTIALS OF THE DISEASES OF CHILDREN. By WILLIAM M. POWELL, M.D. Third edition. Thoroughly revised by ALFRED HAND, JR., M.D., Dispensary Physician and Pathologist to the Children's Hospital, Philadelphia. 12mo., 259 pages. Philadelphia and London: W. B. Saunders & Co.

THE third edition of this useful volume has been amended and revised so that it fully maintains its standing as a compend of the science of pediatrics. The revision has been ably conducted so as to retain the character which has caused the book to become popular and yet to introduce into it all that recent progress has made necessary.

G. M. C.

PRACTICAL HYGIENE. For Students and Practitioners of Medicine and Medical Officers. By CHARLES HARRINGTON, M.D., Assistant Professor of Hygiene in Harvard Medical School, Boston. In one very handsome octavo volume of 718 pages, with 105 engravings, and 12 full-page plates in colors and monochrome. Philadelphia and New York: Lea Brothers & Co., 1901.

THE first two hundred pages of this work are devoted by the author to a consideration of foods. He takes up severally the meats, vegetables, fruits, wines, beers, spirits, etc., that enter into diet generally, and studies them from the physiological and hygienic side, treating also of their toxic properties under certain conditions.

The important subjects of the transmission of disease by meat, fish, milk, and the importance of proper regulations in regard to meat inspection and slaughtering are given most full treatment.

Under the heading of cases illustrative of poisoning by fish and meats, the author cites many interesting cases of epidemics of poisoning due either to direct bacterial poisoning or to the toxins already formed before ingestion of the food. The question of milk as a factor in the spread of disease is particularly interesting, and is dealt with very

fully. The various adulterations of food products are also discussed, and the chemical and physical means for their detection.

Under the chapter devoted to air the author takes up the study of the composition of the air, the changes that occur in it from natural as well as from artificial causes, the effects of bad air, and the part played by it as a carrier of infection. In addition there is considerable space devoted to the examination of air, the determination of the amount of carbolic acid, carbon monoxide, aqueous vapor, and bacteria. In studying the soil as a factor of diseases, the author is most clear and interesting in his statements.

Many diseases which formerly were considered as soil diseases have been proved to have but an indirect relation at most, and perhaps even no connection whatever to it. To quote the author on this subject: "Our actual knowledge of the relation of soil to disease amounts in brief to this: that surface dampness is favorable to the development of certain diseases, as rheumatism, neuralgias, and affections of the respiratory tract; that the soil is the home of many species of organisms, some of which are pathogenic, and offers under certain favorable conditions at least temporary asylum to others.

"But the preponderance of evidence thus far goes to show that under normal conditions the soil is more likely to prove hostile than hospitable to most of the infective agents with which we are well acquainted."

Under water the author takes up a thorough study of the classification of waters, and their hygienic values for drinking purposes, the substances found in water, the various sources of supply, the methods of filtration on large and small scales, the disorders connected with organic pollution, and the most important question of the influence of water in carrying infections, especially those of typhoid fever and cholera—the two diseases, epidemics of which have been most conclusively traced to infected water supplies.

Various examples illustrative of the part played by water in causing epidemics of typhoid fever are quoted, with the abrupt improvements instituted by the adoption of filtration methods. It is interesting to note that the introduction of sanitary measures with a view to control the dreadful outbreaks of cholera in India are handicapped, and, indeed, rendered almost impossible because of their conflict with the religious customs of centuries, which demand that the natives shall drink water which may have previously been bathed in by large numbers of people as well as used as a wash-tub for filthy clothing and a burial-place for dead bodies.

The values of chemical and bacteriological examinations of water are discussed and the disappointing results mentioned in not finding pathogenic germs in water known to be the cause of disease. Considerable space is given to the study of habitations, schools, etc., with the problems of heating, ventilation, and plumbing and the disposal of sewage and garbage.

The following two chapters are devoted to the subjects of disinfectants and disinfection, quarantine and the quarantine laws.

The author gives a considerable space to the discussion of formaldehyde which has recently come into such general use as a disinfectant, giving the methods of use, the various kinds of apparatus in use, the germicidal properties, and the conditions favoring its action, together

with the details of the quantities per cubic foot necessary for thorough disinfection.

Military and naval hygiene as well as tropical hygiene have become matters of unusual importance since the beginning of our war, and the acquisition of new territory. Under these heads the author takes up consideration of the examination of recruits, clothing of soldiers, their food, the diseases common to them, the study of the location of posts and camps, the ventilation and general hygiene on shipboard, and the rules that should be adopted to preserve health and avoid epidemics in tropical countries for civilians as well as for soldiers.

Chapters on hygiene of occupation, vital statistics, personal hygiene, vaccination, and disposal of the dead complete the work. *Practical Hygiene* should prove a valuable work to students, medical officers, and general practitioners, and a book of reference in all things pertaining to sanitary matters.

The author states in his preface that he has advisedly left out a chapter on elementary bacteriology, which has commonly been introduced of late into works on hygiene, claiming—we think, justly—that that subject is distinct in itself and generally taught either separately or in connection with pathology. J. N. H.

RUDIMENTS OF MODERN MEDICAL ELECTRICITY, ARRANGED IN THE FORM OF QUESTIONS AND ANSWERS PREPARED ESPECIALLY FOR STUDENTS OF MEDICINE. By S. H. MONELL, M.D. Pp. 165. New York: Edward R. Pelton, 1900.

THIS little book is intended as a quiz compend to supply medical students with the essential facts regarding the uses of electricity in medicine. We think it is very adequately adapted for that purpose, although, of course, not answering the uses of the larger text-books on medical electricity. A number of well-executed illustrations accompany the text. G. M. C.

A REFERENCE HANDBOOK OF THE MEDICAL SCIENCES. Embracing the Entire Range of Scientific and Practical Medicine and Allied Science by Various Writers. A new edition completely revised and rewritten. Edited by ALBERT H. BUCK, M.D. Vol. I. New York: William Wood & Co.

IT is with somewhat the same feeling of pleasure with which one greets an old friend that it becomes our privilege to review the first two volumes of the new edition of the *Reference Handbook of the Medical Sciences*. We know of no undertaking of its kind which reflects more credit upon the publishers and the authors than this encyclopedic work. The individual articles are the work of men of recognized authority in the various subjects of which they treat. Each of the articles which appeared in the former edition has been so carefully edited and brought up to date that they all are practically rewritten. The many

new subjects brought forward during the years which have elapsed since the *Reference Handbook* was first published are adequately treated of, and in a careful search we have been unable to find anything of real value in the recent progress of medicine which should have been included, left out.

One of the most valuable series of articles in the first volume is that which deals with the various matters appertaining to the army medical service. Among the authors dealing with these important topics we find such authorities as Surgeon-General Sternberg, Colonel Charles Smart, Captain Edward L. Munson, and Dr. Anita Newcomb McGee.

In the second volume, probably the most noteworthy contributions are those dealing with the brain and blood, Dr. W. W. Keen contributing the article on cerebral surgery, and Dr. M. Allen Starr that on the diagnosis of local brain lesions. The anatomy and histology of the brain are very thoroughly discussed by Dr. Burt. G. Wilder, and his work is rendered of particular value by the accurate and clear illustrations by which it is accompanied. The articles on the blood are valuable for their thoroughness and the care with which all the most recent methods of blood examination are detailed. Drs. Camac and Hektoen have elaborated their work on this subject so as to make it of the greatest use to all those who may find occasion to consult this book as a guide in their laboratory work. The two volumes cover the letter A and a large part of the letter C. An important feature which renders the *Reference Handbook* of especial value is that all of the leading articles are signed by their authors. F. R. P.

A System of Practical Therapeutics. By Eminent American and Foreign Authorities. Edited by Hobart Amory Hare, M.D., Professor of Therapeutics, Jefferson Medical College; Physician to Jefferson Medical College Hospital, etc., Philadelphia. New (second) edition, thoroughly revised. In three handsome octavo volumes, containing 2593 pages, with 427 engravings and 26 full-page colored plates. Philadelphia and New York: Lea Brothers & Co., 1901.

The medical profession is already familiar with Hare's *System of Practical Therapeutics*, which was published ten years ago. In this edition nearly half the chapters are entirely new, and the remaining articles have undergone a most thorough revision. Among those subjects which have thus demanded new presentation may be mentioned diabetes mellitus, diphtheria and spasmodic croup, scarlet fever, measles, rötheln and varicella, typhoid fever, croupous and catarrhal pneumonia, dengue, influenza, acute articular rheumatism, and tonsillitis, mumps and diseases of the mouth, diseases of the liver and gall-bladder, tuberculosis, rickets, scurvy, the diseases of pregnancy, parturition and the puerperium, fractures and dislocations, antisepsis and asepsis, anæsthetics, minor surgery and bandaging, disinfection, mineral springs, Swedish movements and massage.

The first volume of the *System* contains twenty contributions on remedial measures other than drugs: prescribing, preventive medicine, and the treatment of diathetic and nutritive diseases.

The second volume deals with the treatment of fevers, skin diseases, the respiratory, circulatory, renal, and nervous systems, and is divided into twenty-nine chapters, contributed by twenty-five well-known authorities, almost all of whom are teachers of the subject on which they write. Ten of the chapters are entirely new, the rest have been overhauled and carefully amended. It is written from a bedside standpoint, in lucid terms, which, though not dogmatic, are sufficiently positive and convincing to guide rather than direct. It is a work calculated to make the reader think, containing exercises for his judgment. A drug is not recommended for a symptom, but the cause of complaint is diligently sought, removed if possible, and the effect is combated with an eye to the individual as well as to the disease. An effort is made to inculcate rational instead of routine treatment, to smooth ruts with reason, and to append to each recipe brains quantum sufficit. Hare well says that "the curse of therapeutics is the fact that physicians do not think for themselves, but blindly follow some method." Archaic procedures and untried novelties, with a few justifiable exceptions, are excluded.

The third volume embraces anæsthesia, surgical technique, fractures, dislocations, minor surgery, surgery of the lungs, pleura, peritoneum, rectum, and anus; diseases of the genito-urinary apparatus, pregnancy, parturition, and the puerperium, and diseases of the eye, ear, and upper respiratory tract.

C. L. Leonard contributes the article on anæsthetics. He urges the use of ether in almost all cases, stating that "the reasons for using chloroform narrow themselves down in the majority of cases to the self-interest of the operator in saving time." Chloroform, ethyl bromide, and medullary narcosis are not discussed, and the writer fails to mention the sloughing which sometimes follows the use of eucaine.

The technique of surgery is elaborated in a careful manner by C. H. Frazier. Under surgical bacteriology he confuses leucomaïnes and ptomaïnes. In preparing a case for operation he omits the interrogation of the patient concerning hæmophilia and the blood examination. The former we have had occasion to deeply regret; the latter attains special eminence in the victims of anæmia.

Concerning the treatment of fractures by massage, H. R. Wharton writes that as an exclusive method it has not found its way into great favor. He believes the non-operative treatment of patellar fracture to be the method applicable in the majority of cases, and the ambulatory treatment of fractures to be still on trial, its advantages not being outweighed by its dangers and disadvantages.

We find an admirable disquisition on pleural effusions, abscess and gangrene of the lung, by A. J. McCosh, who maintains that simple thoractomy without costal exsection is sufficient, as a rule, for empyema in children, and that irrigation is often indicated where the pus is foul or large masses of fibrin are present. There is still much missionary work to be done for the surgical treatment of abscess and gangrene of the lung, and McCosh's article will aid in creating a disposition on the part of the physician to persuade his patient to submit to an early operation and not wait until the patient is so saturated with sepsis that any operative procedure would not only be futile but would hasten the lethal exit.

Because peritonitis is almost always a symptom of a grave intra-abdominal lesion necessitating at least exploration, we are not partial

to the prominence given its medical treatment by G. R. Fowler; it will lead to pernicious procrastination. His technique for the surgical treatment we believe to be the most efficient. He practices copious irrigation instead of gauze curettage, and after operation places the patient in the elevated head and trunk posture.

The therapeutics of pregnancy, parturition, and the puerperal state, by E. P. Davis, is an excellent paper written with the wonted lucidity of its author.

The three volumes contain numerous well-executed illustrations, which are well chosen for their value in the elucidation of the text. The typography and get-up of the volumes are fully up to the standard of excellence heretofore maintained by this publication. F. T. S.

A Compend of Human Physiology, Especially Adapted for the Use of Medical Students. By Albert P. Brubaker, A.M., M.D., Adjunct Professor of Physiology and Hygiene in the Jefferson Medical College, etc. Philadelphia: P. Blakiston's Son & Co., 1900.

This excellent little work is fully worthy of the success which has brought about the appearance of its tenth edition. Although it does not supplant the larger text-books on the subject, yet it is to be heartily commended as a *vade mecum* for the student. G. M. C.

Diseases of the Ear. By T. Mark Hovell, F.R.C.S. Edin., M.R.C.S. Eng.; Aural Surgeon to the London Hospital; Consulting Surgeon to the Hospital for Diseases of the Throat, Golden Square; Lecturer on Diseases of the Throat, London Hospital Medical College; Aural Surgeon, British Home for Incurables. Second edition. Philadelphia: P. Blakiston's Son & Co., 1901.

This book has been written, as the author states in his preface, particularly for the use of those physicians who give special attention to diseases of the ear. With this in view one cannot but be disappointed by the somewhat scanty space devoted to the consideration of what most aurists regard as the more difficult problems met with in the treatment of such pathological conditions. The book is comprehensive in the number of topics discussed, the defect in our opinion consisting in a somewhat sketchy treatment of the individual subjects. If the author had written a book for students or for occasional reference by the general practitioner, this criticism would not hold.

In the consideration of the aurist's armamentarium there are several assertions made to which many aurists would take exception. Thus we think few would agree to the statements that "the best form of speculum is that which is known as Brunton's," and that "for the removal of tonsils Morell Mackenzie's modification of Physick's tonsillotome is the most suitable instrument." Many of his other statements as regards

methods of examination and treatment would be open to objection, but would not be subject to criticism if they were not couched in such positive terms.

With the above exceptions the book is worthy of commendation. The author expresses himself in well-chosen terms and is concise and clear. His high standing as an otologist certainly justifies to a large degree the positiveness of his statements, and the book is one which should be at hand for consultation by those physicians who are especially interested in the subject, for whose behoof it was written.

F. R. P.

STUDIES IN THE PSYCHOLOGY OF SEX. The Evolution of Modesty—The Phenomena of Sexual Periodicity—Auto-erotism. By HAVELOCK ELLIS, M.D. Pages xii., 275. Philadelphia: F. A. Davis Company.

THIS work consists of three studies under the headings of modesty, sexual periodicity, and auto-erotism.

The study of the evolution of modesty in animals as well as in man is dealt with in an interesting manner, and the author considers its development in the customs and manners observed in savage and civilized people.

The phenomena of sexual periodicity in women is discussed, and a physiological and psychological rhythm demonstrated.

In men also the author takes up the question of monthly sexual cycles and of a general physiological cycle, and on these subjects an appendix is added by F. H. Perry-Coste, B.Sc.

The greater part of the work is included in the chapter on Auto-erotism, a term apparently coined by the author by which he means "the phenomena of spontaneous sexual emotion generated in the absence of an external stimulus." Under this heading a great variety of subjects are treated, many of which, however disagreeable they may be, are matters of growing importance, and not often as plainly dealt with as herein.

The whole work is carefully written, and shows careful preparation, although we do not see that it would prove of any particular value to physicians in general practice or to others except in special cases.

J. N. H.

EXPERIMENTAL RESEARCH INTO THE SURGERY OF THE RESPIRATORY SYSTEM. An Essay awarded the Nicholas Senn Prize by the American Medical Association for 1898. By GEORGE W. CRILE, A.M., M.D., Ph.D., Professor of Clinical Surgery, Medical Department, Western Reserve University; Surgeon to St. Alexis Hospital, Cleveland. Second edition. Philadelphia: J. B. Lippincott Co., 1900.

THIS very valuable contribution to surgery embraces the results of and the practical deductions obtained from a series of experiments on 102 dogs, all of which were fully anæsthetized before experimentation and killed while still narcotized. It demonstrates the author's infinite

capacity for labor, as the work has occupied a period of two years, and has been conducted with the sole desire to arrive at the truth without reference to previous theories or notions.

Crile carefully investigates the cause of the phenomena attending the inhalation of hot air and flame; the cause of certain symptoms observed on entering an atmosphere of increased barometric pressure, and the cause of collapse or death from blows on the lower chest and epigastrium, the evidence presented tending to show that the solar plexus may be disregarded as a factor, and that the real cause of the striking phenomena is the mechanical effect of violence upon either the heart muscle or upon its nerve mechanism. He notes the effect of filling the chest with fluid, the effect of manipulation of the brachial plexus and nerves supplying some of the respiratory muscles, and studies the mechanism of drowning.

From his experiments he learns and teaches practical lessons concerning laryngotomy, tracheotomy, and intubation. He advises spraying the larynx with cocaine to protect against sudden collapse, and the injection of atropine hypodermically to paralyze the nerve endings of the vagi in the heart, so insuring this organ against reflex inhibitory impulses. He points out that sufficient traction on the tongue will cause arrest of the respiratory and cardiac action—a fact to be remembered by an over-aggressive anæsthetizer.

This book has been or will be read by all interested in the surgery of the respiratory system. F. T. S.

THE YEAR-BOOK OF THE NOSE, THROAT, AND EAR. The Nose and Throat, edited by G. P. HEAD, M.D.; the Ear, edited by A. H. ANDREWS, M.D. Chicago: The Year-book Publishers, 1901.

WE are glad to notice the reappearance of this most useful little book. It comprises within its pages an epitome of the most advanced literature on diseases of the nose, throat, and ear, both foreign and American. The abstracts are especially well done, not too lengthy, and yet full enough to give the complete sense of the author. The book is invaluable as an addition to the library of a physician especially interested in the subjects of which it treats. F. R. P.

OBSTETRICS: A MANUAL FOR STUDENTS AND PRACTITIONERS. By DAVID JAMES EVANS, M.D., Lecturer on Obstetrics and Diseases of Infancy, McGill University, Montreal, Canada; Fellow of the Obstetrical Society of London, England. Edited by BERN B. GALLAUDET, M.D., Demonstrator of Anatomy and Instructor in Surgery, College of Physicians and Surgeons, Columbia University, New York; Visiting Surgeon Bellevue Hospital, New York. Pp. 417, with 149 illustrations. Philadelphia and New York: Lea Brothers & Co.

THE author states in his preface that his object in writing this book is to supply to the student and junior practitioner of medicine with a short

and concise treatise on the science and art of obstetrics. There are at present many such manuals on the market, but it is seldom that we have seen one in which the subject has been so well handled as in the work before us.

We are particularly pleased with the chapter on embryology, a subject always held in dread by medical students, and one which every author finds difficult to describe in a condensed form. This article, although of necessity brief, is not only well written, but is plainly illustrated. We notice in this chapter that a short description of the syncytium has not been forgotten. The chapters on the diagnosis of pregnancy and the anatomy of labor are especially clear, and are illustrated with good diagrammatic drawings, which are in the majority of cases much more useful for teaching purposes than photographs taken from life. The modern methods of asepsis and antisepsis have all we believe been considered. We note that the author has followed the regulation method of teaching four positions to each presentation. More space, we think, might have been given to the most important subject of the toxæmia of pregnancy, or, as the author has described it, the premonitory symptoms and prophylactic treatment of eclampsia. The complications of the puerperal state have been considered at some length. The book is unusually well illustrated, the printing clear, and the binding attractive. We feel certain that as a manual of obstetrics this book will find quite an extended field of usefulness.

W. H. W.

LECTURES ON NASAL OBSTRUCTION. By A. M. SHEILD, M.D. Philadelphia: P. Blakiston's Son & Co., 1901.

THIS little book is elaborated from three lectures delivered by the author at St. George's Hospital during the year 1900. The lectures were addressed to students, and the little book will find its chief usefulness among students and general practitioners. It contains, however, much of the greatest value to the specialist in rhinology. Based as it is on a large clinical experience, it conveys the gist of the author's conclusions as regards the best methods to use in dealing with pathological conditions of the nasal chambers. There are numerous well executed illustrations, and we think the book certainly deserves perusal by all those who are called upon to treat the condition named in its title.

F. R. P.

THE TREATMENT OF FRACTURES. By CHARLES L. SCUDDER, M.D., Assistant in Clinical and Operative Surgery, Harvard Medical School. Second edition, revised and enlarged. Octavo, 433 pages, with nearly 600 original illustrations. Philadelphia and London: W. B. Saunders & Co.

As a guide to the practitioner and student this work can be heartily commended, although not above criticism in certain chapters. The treatment of most fractures is carefully and comprehensively described, and each dressing illustrated by excellent photographs and drawings.

It is a satisfaction to see the treatment outlined so carefully and so well illustrated that one who might consult the book would find the descriptions easily understood and followed. Seldom have we seen a book in which the illustrations serve their purpose better than in this second edition of Scudder's work. The chapter on fractures of the skull impresses one as being very brief as compared with the number of pages devoted to other fractures, and altogether too brief to serve the purpose just ascribed to the other portions of the book. In his description of the treatment of Colles' fracture the author makes no mention of the Bond splint, an omission which one who is familiar with this dressing would be inclined to criticise. Another omission which we notice is in the treatment of fractures of the leg where the author makes no reference to the fracture box, although he does describe Cabot's dressing of a posterior and two lateral splints which very closely resembles the fracture box. A number of X-ray pictures have been added to the work in an attempt to familiarize the reader with the proper interpretation of X-ray plates. It is a disappointment to find at the end of so excellent a volume so unsatisfactory an index. J. H. G.

NURSING ETHICS. By ISABEL HAMPTON ROBB. Cleveland: J. B. Savage, 1900.

A TEXT-BOOK on the subject of nursing ethics has been greatly needed in hospital training schools, too little attention having been given to this very important part of the nurse's training, and all nurses, whether they be graduates or still in training, should avail themselves of this valuable addition to the books written for their benefit and instruction.

Mrs. Robb has thought her subject out carefully, has said just what is wanted, and has said it well. She has written in a systematic way, giving special attention in turn to the probationer, junior nurse, senior nurse, and to the graduate, both as head nurse and on private duty. In thus grouping them she has supplied superintendents and other nurse teachers with a most excellent text-book which may be used with advantage during the entire term of training.

In the opening chapter the writer mentions the great need for a code of ethics in the nursing profession.

"I am convinced that many a woman's success, either as a pupil or as a graduate nurse, is wrecked not for lack of knowing how to do her work well, but from her ignorance or neglect of the practical application of the ethical side of her profession.

"Only rarely does one hear criticisms directed against the purely practical work of a nurse; on the other hand, the ethical side is being constantly attacked and too frequently, I fear, with sufficient cause."

A brief sketch of nursing history is next given, showing how wonderfully improved has been the care of the sick since the advent of the modern trained nurse in 1873, when Sister Helen came over from England to take charge of the Nurses' Training School attached to Bellevue Hospital, New York. This is followed by an enumeration of the necessary or desirable qualifications to be possessed by the would-be nurse which are summed up in well-chosen terms.

The different virtues which should be especially emphasized in the training of a nurse are well brought out, such as obedience, discretion, and faithfulness to trust. The graduate nurse in private duty receives perhaps a larger share of the writer's attention than is necessary, as the hints on the methods of work should properly find their place in a book on practical nursing. As a pioneer work of its class the book deserves great praise, and should be certainly read by not only nurses but those who are interested in the nursing profession, such as physicians and hospital managers. No one is better qualified for the task than the author, and she is to be congratulated on the result of her labors.

L. W.

THE FEEDING OF INFANTS. A HOME GUIDE FOR MODIFYING MILK. By JOSEPH E. WINTERS, M.D., Professor of Diseases of Children, Cornell University Medical College. Pp. 47. New York: E. P. Dutton & Co.

THIS little book seems to be a brief description of the most commonly used methods for the home modification of cow's milk for infant feeding. It appears to be intended more for the instruction of mothers and nurses than for the medical profession. Many of the methods of milk modification are briefly described, and a number of tables are used.

W. H. W.

THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE NOSE, THROAT, NASOPHARYNX, AND TRACHEA. For the Use of Students and Practitioners. By CORNELIUS G. COAKLEY, M.D., Professor of Laryngology in the University and Bellevue Hospital Medical College, New York. New (second) edition. In one handsome 12mo. volume of 556 pages, with 103 engravings and 4 colored plates. Philadelphia and New York: Lea Brothers & Co., 1901.

THE first edition of this excellent little manual has already been reviewed by the writer at considerable length in the pages of the JOURNAL. The short time which has elapsed before a second edition has become necessary speaks for itself as to the value of the book. The present edition has been somewhat enlarged, thoroughly revised, and two accurate as well as handsome colored plates added. Its usefulness as a manual for the student or for those who do not desire the larger text-books on this subject is very great. The views expressed on various subjects are those which meet with the most general acceptance, and the author's discussion of the various topics is not obscured by advancing theories which only serve to confuse the minds of students, for whom this book is primarily intended. Particularly to be commended is its handy size and shape and the lightness of the book. Although it contains 566 pages, it can be readily carried and lends itself to easy reference.

F. R. P.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

PROFESSOR OF MEDICINE IN THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND,

AND

W. S. THAYER, M.D.,

ASSOCIATE PROFESSOR OF MEDICINE IN THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

General Infection Following Gonorrhœa.—ULLMANN (*Deutsch Arch. für klin. Medicin*, 1901, lxix., 309) reports five interesting cases observed during six months in the medical clinic of Greifswald. The first case was one which was clinically regarded as a cryptogenetic septicæmia. On autopsy, however, it was found that an unrecognized gonorrhœa of several months' duration had been followed by a prostatic abscess without symptoms during life. This resulted in a septic thrombosis of the prostatic plexus and a subsequent pyæmia. The second case was one of extremely severe general infection in which, during life, typhoid fever had been suspected. On autopsy, however, there was found a staphylococcus abscess of the prostate which had been followed by pyæmia. No changes in the urethra were made out, but the abscess was probably the result of a previous gonorrhœa. The third case was also one of gonorrhœa followed by prostatic abscess and pyæmia, although, at the time of entry, no urethral discharge was present. A secondary periorchitic abscess was recognized during life, but the suppurative prostatitis was not suspected. The fourth case was also an instance of prostatic abscess followed by cystitis and pyæmia, in which, *intra vitam*, the prostatic changes were thought to be malignant. There was no evidence of gonorrhœa in this case, but the author believes it probable that an urethritis was the starting-point of the process. In addition to these cases, Ullmann reports an instance of general septicæmia, pericarditis, and ulcerative endocarditis following gonorrhœa with arthritis.

The author reviews the literature concerning various metastatic, secondary, and mixed infections which may follow gonorrhœa, and calls particular attention to the importance of suspecting gonorrhœa, and especially prostatic abscess, as a possible cause of septicæmia and pyæmia without apparent point of origin. These cases emphasize the fact that a prostatic abscess resulting in

the gravest complications may be of moderate size, and may give rise to few, if any, local symptoms. In the words of the author, "It is strongly to be recommended, in all cases of cryptogenetic septicæmia in men, that a careful examination of the prostate should be made, even in the absence of a history of gonorrhœa, and without pathological manifestations in the external genitalia or in the urine."

The Causal Element of Vaccinia and Variola.—FUNCK (*Deutsch Med. Wochenschrift*, 1901, xxvii., 130), in a preliminary report of studies carried out in the Sero-therapeutic Institute of the University of Brussels, states that he has convinced himself of the following facts:

1. Vaccinia is not a bacterial disease.

2. Vaccinia is a protozoal infection. The causal agent is easily examined in all vaccinial pustules and in active lymphs.

3. The inoculation of these parasites in a sterile emulsion brings about in animals all classical appearances of vaccinia.

4. The inoculation of this emulsion makes the animals resistant against further inoculation of vaccine.

5. The pustules of variola contain a protozoon which is similar, morphologically, to that of vaccinia.

6. As a result of these experiments it is shown that variola and vaccinia are two identical affections; that vaccinia is only a milder form of variola, and that, as a result of this, the anti-variolic immunity which is established by vaccination comes entirely under the general laws of specific immunity.

It has been shown that lymphs preserved in glycerin and proven to be absolutely sterile in all ordinary culture media may yet remain characteristically active, a fact suggesting that the activity is due to some organism other than a bacterium.

In fresh lymph characteristic elements are to be found, doubtless identical with those originally described by L. Pfeiffer, and clearly corresponding to large egg-shaped non-staining vacuoles which are seen in dried specimens.

There are to be found:

1. Refractive structures of a glistening green appearance, from 2 to 10μ in size, which show slow but characteristic movements at 37° C.

2. Egg-shaped cells which, more or less elongated, show a laterally placed nucleus and, in the protoplasm, fairly rounded clumps of glistening spheres which are similar to the before-described elements, and are from 1 to 3μ in diameter.

3. Finally, and most abundantly, there are to be found in all lymphs yet larger structures, often rounded, and 25μ in diameter, with or without double contour, sometimes egg-shaped and 30 to 35μ in length by 20 to 25μ in breadth. These, he believes, are cysts (sporoblasts), full of spores, in which the nucleus appears in the shape of a voluminous clear spot, sometimes in the middle, sometimes upon one side. These cysts have sometimes a pear-shape, and are found in the contents of pustules, in tubular accumulations which are of greater or less length and may consist of twenty to forty elements.

In old lymphs these last forms are more frequent, while in the fresh extracts of pustules the first are commonest, swimming between the pus corpuscles. Funck suggests that the organism be called *sporidium vacciniale*.

In a hanging drop it is found that, while the leucocytes fall to the lower part of the drop, the protozoon is to be found upon the under side of the cover-glass.

These structures are so large that the author has been able, with a very fine spatula made of platinum wire, under low powers, to actually separate individual elements. These, after being washed twenty to thirty times in a drop of bouillon, still produce, when inoculated into calves, typical pustules on the sixth day, the animal acquiring also a characteristic immunity. Similar structures are found in the pustules of true variola.

This observation relates unquestionably to elements which have been noted by a number of other students. The inoculation experiments, after apparent separation of individual organisms, are especially interesting, and further reports may be looked for with considerable interest.

Observations on Experimental Vaccinia.—CALMETTE and GUÉRIN (*Annales de l'Inst. Pasteur*, 1901, xv., 11) repeated some of the studies of Gailleton and Bard and Leclerc in the hope of finding a method to control with precision the virulence of vaccines of different origin and age. They confirmed the observations of these authors in showing that the rabbit was subject to vaccinia. By repeated experiments they became convinced that the rabbit is less susceptible to vaccinia than calves or children, which suggested to them that this animal might be employed for control of the virulence of various vaccines. At present all vaccines passing through the Pasteur Institute at Lille are tested on two rabbits before being distributed. A vaccine which is virulent for the rabbit is sure to be satisfactory in a human being.

In some experiments upon a vaccinial immunity in the rabbit they show that this is produced, however the vaccine is introduced, in from five to six days. But observations appear to show that the infectious agent, whatever it may be, does not multiply in any organ to which the leucocytes have access, with the exception of the cutaneous surface. The lesion of the skin is indispensable for the implantation and evolution of the vaccine.

They have further carried on various experiments concerning the possibility of cultivating the virulent agent of vaccinia without success. They note, however, that when one examines microscopically with the highest powers lymph obtained with every possible antiseptic precaution on the fourth day, there are found very few bacteria stainable by ordinary methods, but when examined unstained many very minute refractive motile granules are to be made out. These they suspect may be the infectious agents of vaccinia, especially as they are never to be found in the blood or in exudates met with in animals with vaccinial eruption. In glycerinized vaccinial pulp these granules are larger and immobile. It is also to be noted that the better the quality of the vaccine the more numerous they are. After one has become accustomed to the microscopical study of vaccines, one may affirm almost with certitude that the vaccine will be good or bad according to the number of these refractile free granulations. Cultures, unfortunately, have been without result.

It was difficult to obtain vaccine free from other organisms capable of growth in artificial media, and yet capable of developing pustules when

inoculated upon the freshly shaven skin. Glycerin does not entirely free the serum from other micro-organisms. The authors, however, have adopted an ingenious and apparently satisfactory method of purifying vaccine. After injecting 10 to 20 c.c. of bouillon into the peritoneum of a rabbit so as to provoke an exudate, they introduce four or five hours later a small quantity of freshly glycerinized vaccine in 1 c.cm. of bouillon. After four hours, by puncture or by killing the animal, the exudate is removed. In cultures this is generally found to be apparently sterile, but capable of producing a few pustules when introduced under the skin of a rabbit. The infectious agent of vaccine has not then multiplied in the peritoneum of the rabbit, but the other bacteria have been removed, while the organism of vaccine has been, at least in part, spared. They endeavored to suppress the effects of dilution by introducing vaccine, not into the prepared peritoneum of a new rabbit, but into that of a rabbit at the height of the vaccinial eruption on the third day. After three and a half hours they obtained exudates which, when tested on new rabbits, produced confluent eruptions and yet gave no growths in artificial media. But often, especially on introducing into the peritoneum glycerinized pulp instead of the fresh pulp, the exudates, after four hours, are no longer virulent and give but a few pustules. They tried without success to cultivate aseptic vaccinial exudates in collodion sacs or by successive passages from peritoneum to peritoneum in rabbits at the height of the vaccinial eruption on the third and fourth day. They were, however, unable to obtain a multiplication or culture of the virulent elements of vaccine in the normal exudates of the rabbit, but by allowing vaccines to remain for a greater or less length of time in the peritoneum of prepared animals, aseptic sera may be obtained, vaccines which contain no micro-organisms capable of growth in artificial media, but are yet capable of producing vaccinial pustules and immunity. They conclude:

1. The inoculation of vaccinia to the rabbit is always followed by a confluent eruption of small pustules very rich in lymph, if one take the precaution not to insert the vaccine in scarifications, but simply to spread the virulent substance upon freshly shaven skin.

2. The rabbit is an excellent control animal, permitting the verification of the virulence of vaccines obtained from calves or children, as well as that which has been preserved for some time in glycerin.

3. The multiplication of the virulent elements of vaccinia does not appear to take place in the rabbit in any other organ than the skin.

4. Aseptic vaccines may be obtained—that is, vaccines giving rise to no development of bacteria in artificial media, as a result of purification by a sojourn of several hours in the peritoneum of rabbits prepared by a previous injection of bouillon. The leucocytes then make away with the foreign micro-organisms, respecting for a longer time the virulent elements of vaccinia.

Obstetrical Paralysis, Infantile and Maternal.—Obstetrical paralysis is of interest to the physician as well as to the obstetrician. THOMAS (*Johns Hopkins Hospital Bulletin*, November, 1900, p. 297) reports two cases in mothers and three in babies. In one instance a mother and baby were paralyzed in the same labor. In the infant the paralysis is that known as

Duchenne's obstetrical paralysis of the arm, in which the deltoid, infraspinatus, and flexors of the forearm are affected. This paralysis is characterized by falling of the arm close to the side of the body, the rotation of the arm inward and the extension of the forearm on the arm. The views concerning the etiology of this paralysis have changed in recent years. The early view was that, from various obstetrical procedures, the roots of the fifth and sixth cervical nerves were injured by pressure. The point above the clavicle where this pressure is exerted is known as Erb's point. Erb claimed that the injury was most often due to the so-called "Prager Handgriff," in which the finger is placed above the clavicle and pressure made directly over the point that he described. The view now generally accepted is that the injury results in most cases from mere stretching of the fifth and sixth cervical roots resulting from undue traction on the neck with lateral flexion during labor. This view was first advanced by Carter and later supported by Walton and Tieux. Shoemaker thinks that in breech presentations the cervical nerve roots are occasionally injured by being pressed between the clavicle and cervical spine.

The head presented in all three of Thomas' cases. Forceps were used twice. The cause of the injury to the brachial plexus was definitely determined in only one case; in this there had been traction on the head with strong lateral flexion of the neck, and the injury was undoubtedly due to stretching of the nerve roots. Accidental death occurred in one case nine weeks after birth, the paralysis not having improved. The other two cases entirely recovered. Thomas considers this very satisfactory, as he has seen a number of cases that have persisted until late life. The prognosis depends on the severity of the injury.

The injuries to the nerves of the mother during labor are of even greater interest. Hünermann, who reported four cases and reviewed the literature, determined that the paralysis resulting from trauma during labor nearly always affected exclusively or most intensely the muscles supplied by the external popliteal nerve. This is due to the fact that this nerve receives its fibres mostly from the fourth and fifth lumbar roots. These unite, forming the lumbosacral cord, which passes over the brim of the true pelvis and lies next to the bone, thus being freely exposed to pressure. In the two which Thomas reports labor was difficult and instruments had been used. In one case the pelvis was normal and the child large; in the other the pelvis was generally contracted and the child was very large. In one case the right leg was alone affected, while in the other both legs were involved. The paralysis in both patients was most marked in the muscles supplied by the external popliteal nerve. There was, however, a certain amount of weakness in the other muscles supplied by the sciatic nerve. Thomas draws attention to the fact that paralysis of both legs, as in his second case, is a very unusual occurrence, and he has never met with a description of a similar case. The occurrence was considered still more remarkable in that this patient was the mother of one of the three infants with the Duchenne paralysis.

Windscheit, under the title "neuritis gravidarum und neuritis puerperalis," divides puerperal neuritis into four classes:

1. Certain cases which have developed during pregnancy (neuritis gravidarum) and have persisted after confinement. The etiology of these rare

cases is not known, but they are supposed to be due to the action of some poison circulating in the blood. The clinical picture is that of a pure motor form of neuritis. No special nerves are liable to be affected.

2. Neuritis due to puerperal infection. Here the neuritis is purely local, due to the extension of the inflammatory exudates, so as to involve the pelvic nerves. This form has long been known.

3. Puerperal neuritis due to traumatism during labor. The cases reported by Thomas belonged to this class.

4. Puerperal neuritis (Mœbius). These cases develop in women in whom pregnancy and confinement have been perfectly normal, and in whom there has been no pathological process to which the affection could be traced. There are two forms: (*a*) The localized forms in which only one or two nerves are affected. The prognosis is not entirely good. (*b*) The generalized form, in which the paralysis develops in many nerves at the same time, and often after the manner of Landry's paralysis—*i. e.*, the ascending type. The prognosis is even graver in this form.

Thomas suggests that paralysis occurring in women and infants due to injury during labor be called obstetrical paralysis, and the adjectives, maternal and infantile, be used to distinguish the two conditions. Thus maternal obstetrical paralysis or obstetrical paralysis of the mother and infantile obstetrical paralysis (Duchenne), or obstetrical paralysis of the infant.

Polyorromenitis, or Combined Serous Inflammations.—TAYLOR (*British Medical Journal*, December 15, 1900, p. 1693) in a clinical lecture on combined serous inflammations uses the term polyorromenitis to indicate this condition. We are indebted to the Italian physicians for the term. They have made a special study of these combined serous inflammations in recent years, and have also made use of the term polyserositis. Taylor prefers the term polyorromenitis to polyserositis, as it is of purely Greek derivation. The word ὀρρός in Greek means serum.

The writer gives the histories of two cases of polyorromenitis. In the first case the peritoneum and pleuræ were involved, and tuberculosis was considered the etiological factor. The second case was more acute, and the pericardium was involved in addition to the other two serous membranes. From the history of the case the polyorromenitis was attributed to one of the pyogenic organisms, although no statement was made as to any cultures having been taken at autopsy.

Taylor takes up the etiology of multiple serous inflammations, and divides the cases clinically into the acute, subacute, and chronic forms. The pyogenic organisms are the cause of most of the acute cases, the pneumococcus, streptococcus, and staphylococcus being most frequently found. The organism or poison of rheumatic fever is another cause. The tubercle bacillus is the commonest cause of the subacute and chronic cases.

The analyses of tuberculous polyorromenitis cases made by the Italians show that it is commoner in males than in females, and that the majority of cases occur between the ages of sixteen and thirty. Usually one serous cavity is invaded before the others, and in most cases it is the peritoneum that is first attacked. The interval between the invasion of the different

serous membranes may be a few weeks or some months. The duration is variable. The result may be recovery with adhesions, or it may be a fatal termination in phthisis.

The prognosis of acute polyorromenitis is much graver than that of the subacute and chronic forms. Many of the cases due to pneumococcus die. A still larger number are fatal when caused by the staphylococcus or streptococcus. The prognosis in the subacute and chronic forms, the vast majority of which are due to the tubercle bacillus, is much more favorable. Many cases recover. The figures given by Picchini show that out of fifty cases of tuberculous polyorromenitis there were twenty-two deaths, seven were improved, and twenty-one were cured.

Aneurism of the Aorta Treated by the Insertion of a Permanent Wire and Galvanism (Moore-Carradi Method).—The method described by HUNNER (*Johns Hopkins Hospital Bulletin*, November, 1900, p. 266) is a modification of the Moore process of introducing wire into the aneurismal sac, in which Carradi advocated the passing of an electric current through the wire after its introduction, thus causing an increased liability to the deposition of fibrin within the sac and upon the wire. Hunner experimented in order to find the best means of insulating the needle to prevent loss of the current where the needle passes through the sac wall. He found that the best French lacquer made the most suitable insulator. Wire containing seventy-five parts of copper to 1000 of silver made the best alloy, and permitted of the most satisfactory coiling within the sac. About ten feet of wire are passed into the aneurism. In passing the electricity into the sac the positive pole is connected with the wire and the negative pole with a metal plate at the back. A current of 10 ma. is passed into the sac for about one hour. In the case of aneurism of the abdominal aorta the abdomen has to be opened and the sac wall exposed. In aneurism of the thoracic the needle is inserted through the skin into the sac, using cocaine or ethyl chloride as a local anæsthetic.

Hunner has collected all the cases in which the Moore method of wiring alone was used, as well as all the cases in which wiring and electrolysis were combined. The combined (Moore-Carradi) method had been used in five cases at the Johns Hopkins Hospital.

Fourteen cases have been treated by the Moore method alone. Of these 8 were thoracic and 6 abdominal. Two cases, both abdominal aneurisms, resulted in cures. With the combined method (Moore-Carradi) there have been 23 cases, 17 thoracic and 6 abdominal. Four of these, or 17 per cent., 3 thoracic and 1 abdominal, were cured. In 9 cases, or 39 per cent., the value of the operation was indicated by amelioration of symptoms and prolongation of life. Death was believed to have been hastened in the remaining 9 cases.

Hunner, in his article, is, on the whole, conservative in his statements. He believes, however, that clinical and post-mortem evidence points to the efficacy of the method. The great drawback to the method, he points out, is the difficulty in making an accurate diagnosis of the form and situation of the aneurism. He holds that the results obtained, considering that nearly all the cases were regarded as hopeless and that the method is still crude and in its infancy, are most impressive.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA, SURGEON TO THE UNIVERSITY HOSPITAL,

AND

F. D. PATTERSON, M.D.,

SURGEON TO THE DISPENSARY OF ST. AGNES' HOSPITAL, ASSISTANT SURGEON TO THE DISPENSARY UNIVERSITY HOSPITAL.

Gastro-enterostomy by the Elastic Ligature.—McGRAW (*New York Medical Journal*, January 26, 1901) states that this method of making intestinal anastomosis is unequalled in the rapidity of its execution, its efficiency, and its safety, although it does not accomplish its purpose until after the lapse of two or three days. The disadvantages connected with the use of the Murphy button are that the button may fail to hold the viscera together and the intestinal contents will thus escape into the peritoneal cavity and cause death. Its lumen may become occluded by food or by feces, and, finally, it is by no means always easy to insert and fasten in place, especially when the efferent gut has become small and contracted. The elastic ligature is not suitable for the production of anastomosis between the gall-bladder and the intestine, as the gall-bladder permits the ligature to cut its way through before the viscera have become sufficiently glued together. The best ligature to use is a rubber cord, two millimetres in diameter. This can be threaded on a small needle, and by stretching the rubber during its passage and rendering it thin and small it may be easily drawn after the needle, and its subsequent contraction will then largely increase its size and cause it to more than fill the orifice. The author has operated on five cases by this method. Two died in collapse a few hours after the operation; two of the three others lived, one fifteen and the other fourteen days after the operation, the one dying from starvation due to the anastomosis having been located too near the ileocæcal valve and the other from the formation of the "vicious circle." The ligature must include in one loop all of the tissues it is desirable to sever, and before inserting the ligature the viscera should be joined together by a row of Lembert sutures. The author desires to urge upon surgeons the trial of this method, and he states that he believes that when one has learned to use it, it will never be abandoned for any other procedure.

The Best Means of Securing Deep and Regular Breathing at the Beginning of Anæsthesia.—HOFMANN (*Centralblatt für Chir.*, January 19, 1901) states that the best method of administering chloroform is by the "drop method"—that is, allowing a steady flow of the chloroform, drop by drop, upon the inhaler until anæsthesia results. It is always most necessary in administering any anæsthetic to allow air in excess while the anæsthetic is being administered. The patient in the natural excitement, which the

prospect of the operation has produced, breathes but superficially and struggles against the narcotic, and the anæsthetic which has been poured upon the inhaler evaporates. The result is, that at the end of the operation the patient has apparently had a much greater quantity of the anæsthetic than has really come into contact with his blood or lungs, and has caused the resulting anæsthesia. The best method of securing quiet breathing at the beginning of anæsthesia is to get the patient to count backward from a number having three figures—say 200. In this way, because the larger numbers are more difficult to say and take more time, the patient breathes deeply between each number. Beside this the counting backward requires such a concentration of the mind that the patient's thoughts are diverted from the operation, and a quiet frame of mind is the result, which causes the patient to take the narcotic in full, deep breaths. It has been said that in the case of very nervous patients or those who are unduly excited it would not be possible to get them to count at all, but the author has never had a single case in which after gentle persuasion the patient was unwilling to count. It is always well to have the patient begin to count for at least a minute before any of the anæsthetic is dropped upon the cone, for then the transition from breathing pure air to the mixture of air and narcotic will often pass unobserved. The best assistant one may fairly say is just good enough to take charge of the administration of the anæsthetic.

The Etiology of Dissection and Operation Wounds.—Bacon (*Yale Medical Journal*, December, 1900) states that the foremost place as an infecting agent is to be assigned to the streptococcus pyogenes; the staphylococcus pyogenes aureus is probably the next most frequently found; although sometimes met with in pure culture it is still more frequently found in association with the preceding. All of the well recognized "pyogenic" germs may under favorable circumstances give rise to a more or less virulent process. Outside of the germs more frequently included under the head of "pyogenic" may be mentioned the anthrax bacillus, the bacillus of malignant œdema, the tubercle bacillus, the bacillus coli communis, the diplococcus pneumoniæ, the gonococcus, the bacillus of Eberth, and the virus of syphilis. Clinical experience has clearly demonstrated that the passage of a germ through a susceptible body greatly increases the virulence of the germ, so for this reason the dissection or operation wound is apt to lead to a much more severe infection than an ordinary infection not acquired directly from a human being. That germs on being placed in a medium or locality unfavorable to their growth decrease rapidly in virulence is a well-known fact. It is probable that the full degree of virulence that attends direct inoculation at the time of operation, or at the moment of a post-mortem examination, would not be manifest in an infection conveyed by the same germs at a later period, after the lapse of an interval—during which the germs, even if surviving, were exposed to influences, such as desiccation or chilling, comparatively unfavorable to their existence, or at least to the maintenance of one of their most unstable characteristics—their virulence.

Progressive Ankylosis of the Vertebral Column ("Spondylose Rhizomelique").—Thébault (*Rev. d' Orthopédie*, January 1, 1901) states that this

disease, which is undoubtedly of an ancient origin, was first described by Marie in February, 1898. The disease is not rare, and is more common in the country (where people are exposed to all the inclemencies of the weather) than in cities. This is primarily a general disease, as Leri has observed. In some cases the vertebræ and the large articulations are most affected, while in others it is confined to the extremities. The onset is always most insidious, and is characterized by vague pains in the lumbosacral region and in the hips. These pains may be either paroxysmal or continuous, or, on the other hand, they may be completely absent. The stiffness usually commences in the lumbar region and hips, and little by little extends to the cervical region, which may, however, in some cases be unaffected. When the ankylosis is marked the attitude of the patient is characteristic. He sinks upon himself and contracts himself in some manner. The normal lumbar lordosis progressively disappears, while the cervicodorsal kyphosis is accentuated and exaggerated in a striking manner. The patient is obliged to look constantly in the direction of his umbilicus. The trunk is flattened in an antero-posterior direction, and the abdomen is divided in two by a deep transverse fold. In the course of the ankylosis the respiration becomes frankly abdominal. Often the ankylosis is so complete that the patient cannot touch the bed with his head while in the dorsal position. Pain is sometimes very severe, but it disappears rapidly on lying down. Muscular atrophy is but slightly pronounced at the onset, but it grows progressively worse. Sensibility remains intact, and the reflexes normal. Trouble in locomotion varies with the degree of ankylosis of the two hips. As a rule, locomotion is irregular and very difficult. The patient is often obliged to place his hands upon his knees in order to re-establish his equilibrium and give support to the atrophied muscles of his thigh. In order for him to pick up an object from the floor, it is necessary for him to bend his knees and so get down without flexing the vertebræ and the hips. The evolution of this disease is essentially chronic and paroxysmal. Leri, Gasne, and others have noted prolonged remissions of pain. The diagnosis is never difficult, as the disease is characterized by its commencement in the vertebral column or in the larger articulations. Pott's disease presents an ankylosis which is angular and always localized, while rheumatoid arthritis is characterized by its being confined to the smaller articulations. The pathological anatomy does not differ from that of rheumatoid arthritis in general. The articulations of the vertebra, the costo-transverse articulations, knees, shoulders, hips, and even sometimes some of the smaller articulations, are all involved in the ossifying process until there is complete disappearance of the articular cavity. The etiological factors may be divided into two groups: (1) Traumatism and (2) infection. Acute articular rheumatism and gonorrhœa are without doubt the most prominent diseases of the second class, and among the others are typhoid fever, pneumonia, and grippe. There is no doubt that medical treatment with the iodides, arsenic, colchicum, and salicylates is absolutely without effect. At the onset, massage aided by electricity and forcible fixation give the best results. In the stationary period immobilization and extension are indicated. Later, suspension, passive gymnastics, and mechanical therapy, after the method of Zander, have been followed with encouraging success by Hoffa, Schanz, Baumler, and Leri. It is along these

lines and in this direction that we should direct all our efforts and thereby win much commendation in giving back to these otherwise helpless invalids the use of their legs.

The Bradshaw Lecture on the Association of Inguinal Hernia with the Descent of the Testis.—LANGTON (*Lancet*, London, December 29, 1900) states that this affection is so common that it affects probably not less than 5 per cent. of the entire population at all ages of life. The descent of the testis is a developmental process which exerts a dominant influence as a cause of hernia in infants—an influence, however, less powerful as age advances. The journey of the testicle from its original site of development below the kidney to its ultimate destination in the scrotum materially weakens the lower abdominal walls and thus contributes to no small extent to the extrusion of some of the abdominal viscera, especially if associated with a congenitally elongated mesentery. This want of parietal integrity is chiefly manifested in the early periods of life, but the weakness left by the passage of the testis exists to a greater or less degree throughout life, and thus acts as a predisposing factor of hernia at all ages. The more frequent failure at birth of the right vaginal process explains the large preponderance of congenital hernia on the right side as compared with the left. A hernia descending through the unobliterated portion into the cavity or the tunica vaginalis testis is called a congenital hernia, or, preferably, a hernia into the cavity of the tunica vaginalis testis. The term congenital hernia lacks definiteness, as it may be interpreted in two senses: either that the hernia dates from birth, which is not true, or that it is dependent upon an arrest of development of congenital origin, which is true. This nomenclature should be strictly confined to the anatomical position of the hernia and not to its assumed chronological appearance. In acquired inguinal hernia the protrusion with its sac lies in front of the cord and the testis, the sac being loosely connected with the cord, from which it can be easily detached. In congenital hernia, on the other hand, the constituents of the cord are firmly attached to the sac, so that it needs careful dissection to remove the thin membrane, which forms the congenital sac, and so adds much difficulty in the operation for the radical cure of this variety of hernia. The second variety is the funicular hernia, in which a protrusion takes place into the vaginal peritoneal process, closed only at its lower part and consequently separated from the testicular sac, the upper part being still patent. The third variety of congenital hernia, known as infantile hernia, is seen in an arrested development of the closure of the processus vaginalis, except at the extreme upper part, so that the tunica vaginalis testis extends up to the inner ring where it is closed, in which case a hernia may be protruded behind the process and then descend behind the tunica vaginalis testis to the scrotum. Sometimes the abdominal termination of the processus vaginalis may be patent, so that it is not essential for this communication to be closed to constitute it an infantile hernia. Another variety of infantile hernia is observed from time to time where the hernia, instead of continuing its descent behind the cord and testis, pushes itself forward into the unclosed vaginal process, which, on being opened, reveals the convex tumor bulging the posterior wall forward and occupying more or less of the vaginal sac. This is without doubt one

of the forms of the so-called encysted hernia of Hey and others. There is another form which may be included in infantile hernia, but which presents such differences that it might be classified as a distinct variety of congenital hernia. It consists of an oval fibrous sac, which is pushed vertically downward into an unobliterated vaginal process and attached by its neck to the inner ring. The sac hangs free in the vaginal cavity and differs from the firm, fleshy, and globular sac of the variety just described. Experience shows that hernia in male infants under six months is much more frequent than in females of the same age. Inguinal hernia occurs eleven times more often in boys than in girls under the age of twelve months, the exact figures being 3215 infant boys to 290 infant girls. These numbers refer to the date of the first application of the patients for relief and not to the date of the first discovery of the lesion. The importance of differentiating these is at once apparent, as the first relates only to the age of examination by the surgeon when the patient is under the age of one year, and therefore cannot fail to be correct, whereas the second includes not only these, but also all patients who come for relief at later ages, and date the first occurrence of their hernia to birth, but whose statements cannot be accepted as absolutely reliable. The proportion, as already stated, is under the first class as fifteen males to one female, while in the second class of patients, who date their hernia from birth, it is as sixteen to one. Inguinal hernia in infant boys is three times more frequent on the right side than on the left, whereas in infant girls the two sides are nearly equal. This disproportion between the two sides in boys is explained by the fact that the processus vaginalis is much more commonly patent in boys at birth on the right side than on the left. The consistent preponderance of ruptured boys as against ruptured girls may be accounted for, firstly, in the structural weakness in the abdominal walls caused by the passage of the testis through them during intra-uterine life, whereby the walls are unable effectually to resist the constant pressure from within; and, secondly, to the failure in the perfect occlusion at birth of the processus vaginalis.

During the first year of life hernia in boys reaches the high percentage of 15.22 of the total number, whereas in the case of girls it is only 8.55 per cent. There must, therefore, be some other dominant cause of hernia in boys beyond the general tendency to hernia in both sexes, and this factor is the descent of the testis. Children born prematurely are very liable to hernia at birth; the hernia is more frequently on both sides than when infants are born at full term, the cause being that under these circumstances the vaginal processes are patent on both sides. Herniæ are largely associated with testes which fail to descend to their normal position in the scrotum. Under such conditions they may be completely retained within the abdomen, for they may be arrested in their descent within the inguinal canals or in the inguino-scrotal region; they may be misplaced in regions outside their normal course, and may be found in the thigh, perineum, and peno-pubal regions. Ectopic testes may be associated with hernia, but this is of rare occurrence. Examination of the records of 7661 males who were the subject of hernia show that of this number 4310 were situated on the right side, 2812 on the left side, and 539 on both sides. Statistics record that in 174 cases the testes were misplaced. In cases of so-called hermaphrodism, who are, however,

mostly males, one occasionally meets with cases of inguinal hernia on one or both sides, associated with irreducible bodies in the situation of the external ring. It must not be assumed that all misplaced testes are associated with hernia, though this is usually so. Herniæ may have their origin at birth and they may occur at any age of life for the first time. Congenital hernia may be classified into the following varieties: 1. Hernia into the cavity of the tunica vaginalis testis, which strictly includes the majority of so-called interstitial hernia. 2. Hernia into the funicular process, which descends into the enclosed funicular process of the vaginal peritoneum. 3. Hernia into a post-tunica vaginal sac, commonly known as infantile hernia, in which the protrusion is situated behind a dilated tunica vaginalis, extending as high as the internal abdominal ring. In this class are included also the encysted herniæ, which push before them an invaginated membranous septum into the cavity of an unclosed tunica vaginalis testes. These herniæ are also associated with some anomaly in the closure of the vaginal process. Hernia into the cavity of the tunica vaginalis testes is one of the most common varieties of congenital hernia, and may occur for the first time at any period of life from birth to extreme old age. The percentage rapidly increases from birth till the lustrum of sixteen to twenty years, after which it rapidly declines, so that at sixty years of age the percentage is as low as 0.75 of the total number. Hernia into the cavity of the tunica vaginalis testis is nearly equal on the two sides throughout life, the proportion being 49.58 per cent. on the right side and 48.60 per cent. on the left side. Out of the total number of 8342 cases of right inguinal hernia, 227 were examples of the first form of congenital hernia, and of 5263 patients the subjects of left inguinal hernia, 125 were instances of congenital hernia, or in the proportion of 9 cases on the right side to 8 on the left. The importance of the recognition of this variety of hernia is not inconsiderable, as the probability of the obliteration of the vaginal process is not hopeful, and especially so in the unclosed canal of Nuck. Often the hernia appears to be cured, especially when the patient is under puberty, but the cure is only apparent, and due to the narrowing of the serous canal to such an extent as to prevent the descent of any hernia, but not to real obliteration. Other factors of hernia exist above a patent canal and an unduly large abdominal ring. One patent factor is the elongated mesentery. The herniæ under these circumstances are large, inasmuch as the sac is of congenital origin and capable of receiving a considerable amount of intestine. Herniæ in this variety of congenital patency easily become strangulated and often consist solely of intestine. The prognosis is serious, as the constriction is severe at the inner ring and often there is no omentum to act as a buffer at the seat of strangulation. In early infant life, before any curative operation is admissible, the only course to adopt for the treatment consists in the application of some retentive support, and in the large majority of cases the prognosis is good. The presence of fluid in the sac, passing to and fro from the peritoneal cavity, renders the outlook much less satisfactory than if the protrusion is only intestine or omentum. Such a condition is an indication for operation, and the results of such operations are eminently satisfactory. In this and in the funicular form of congenital hernia the constituents of the cord are more intimately

adherent to the sac than in ordinary acquired hernia, and the danger to the vas deferens is thus correspondingly increased, the walls of the sac being very thin. In exstrophy of the bladder it is very common to find both testes retained in the inguinal canal with hernia into their unclosed sacs. Herniæ into the funicular process are often met with, but their diagnosis presents greater difficulties than do those of the preceding variety. A characteristic case presents an elongated sausage-shaped tumor of uniform calibre throughout in a line with the axis of the cord passing down to the upper border of the testis, from which it is separated by a longer or shorter constriction. The proportion of herniæ into the cavity of the tunica vaginalis testis and into the funicular process is represented by one in every twenty-nine cases, or 3½ per cent. of all cases of inguinal hernia. Funicular herniæ are not so liable to strangulation and are reduced with greater ease than are those into the cavity of the tunica vaginalis, but they are retained by instrumental support with greater uncertainty. The third variety of congenital hernia is infantile hernia and consists of the forms which have already been described. There is still another variety of congenital hernia which may be appropriately called "interstitial," being primarily situated within the abdominal muscular walls, within which is placed an undeveloped testis. An examination of 50,000 cases shows that this hernia occurs in the proportion of one case to 1100 cases. This variety of hernia may be classified according to the direction which the protrusion takes after its passage through the inner ring. Interstitial hernia is comparatively frequent in women, 18 cases occurring out of 13,583 female patients, so that the proportion is one in 760 patients, or nearly twice as frequent as in males. These herniæ in women are often of very great size, and among the causes is probably distention of the abdominal muscles during pregnancy, for most of them were mothers of large families. The treatment of interstitial hernia is neither scientific nor satisfactory, for the pressure of the truss is mainly directed to covering the hernia, and in most instances it is unable to effect complete retention. Operative measures for the reduction and cure of the hernia are often attended with difficulty, as the separation of such an extent of the abdominal muscles renders the complete approximation of the parietes almost impracticable. The size of the hernia is so great that the abdominal cavity is unable to receive such a large accession of viscera, so that the question of an enterectomy must be considered to allow of the complete reduction of the extruded mass.

Some Remarks on the Modern Surgical and Medical Treatment of Epilepsy.—CLARK (*Medical Record*, January 12, 1901) thus summarizes the present status of trephining: 1. Idiopathic epileptics with typical grand mal seizures should never be trephined. 2. Idiopathics, in whom seizures are of the Jacksonian type, should be trephined only when infantile cerebral palsies can be excluded, and when the family and personal degeneracy is at a minimum. If operation is determined upon in such cases a very thorough removal of the epileptogenic area should be made. Even then but a fraction of 1 per cent. recover from their epilepsy. 3. Traumatic epileptics may be trephined when the injury is definitely proven and stands in direct causal relation and has existed not more than two years. The prognosis will then

largely rest upon the degree of the neurotic predisposition present. The earlier trephining is resorted to, after convulsions begin, the better the prognosis. If these rules are followed many less so-called traumatic causes will be trephined, but the result will far exceed 4 per cent. of recoveries. All epileptics trephined for whatever cause must be given post-operative bromide treatment for years.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,
OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,
OF PHILADELPHIA.

The Addition of Sugar of Milk to Cow's Milk.—J. PRECHTL (*Jahrbüch f. Kinderheilkunde*, 1901, Band iii., S. 216) has had occasion to observe several infants fed upon home-sterilized milk whose general condition left something to be desired. These children, without bad hereditary antecedents, were large, but at the same time pale and anæmic, with flabby muscles and slender bones. Their stools were not constipated, contained mucus at times, but were in general normal in appearance. The only noticeable fact of importance was that there were frequent acid eructations with gas, the emission of which gave manifest relief.

The only peculiarity in their feeding consisted in the addition of sugar of milk to increase the sugar percentage to something nearer that of human milk.

The author discontinued the addition of milk sugar and at once the acid eructations and flatulence ceased and the development of these children became normal.

The rôle of sugar of milk in dyspeptic troubles is explained in the following way: Casein, which in cow's milk differs from that in human milk, is combined in both with phosphate of calcium. According to the researches of Rumpf lactic acid possesses the property of precipitating the salts of calcium, and thus the casein is set free and coagulated. Sugar of milk, which easily undergoes lactic fermentation, has the effect of coagulating the casein of cow's milk and rendering its digestion difficult, thus creating conditions favorable for the development of dyspepsia.

The Frequency and Exciting Causes of Infantile Palsy.—ZAPPERT (*Jahrbüch f. Kinderheilkunde*, 1901, Band iii., S. 125) bases this study upon 208 cases of poliomyelitis observed over a space of twelve years in the polyclinic of Vienna. The theory of the infectious origin of poliomyelitis, first pointed out by Strümpell and Marie, is now generally admitted, and one of

the strong arguments in favor of this view is the seriatim or epidemic appearance of the disease. This fact is well shown in the records made by Zappert in the prosecution of this study. These showed that from 1886 to 1897 the number of cases ranged between three and eighteen; in 1898 this average rose to forty-two, to fall to six in 1899. Moreover, of the 129 cases observed between 1886 and 1897 there were thirty-five which began between the months of January and July, and from July to January there were seventy-five, while in nineteen cases the date of onset was not ascertainable. Even if all the uncertain cases were to be ascribed to the earlier half of the year the number occurring from July to January would still be notably the larger. The preponderance of cases in the summer months thus seems quite evident. In the epidemic of 1898 four cases developed from January to July; in July, five cases; in August, eleven cases; in September, twelve cases; in October, four cases; in November, three cases, and in December, one case. Among these cases and also among those of preceding years there was not one instance of family infection, nor were the cases confined to one street, or house, or to a certain section of the city. It therefore seems certain that if infantile palsy is an infectious disease its power of contagion is very limited, in which respect it resembles cerebro-spinal meningitis.

In the great majority of cases the symptoms of onset were little marked. As so frequently happens, the paralysis was often the first symptom to attract the attention of the parents, whether an upper or lower member were affected. Quite often the upper and lower limbs were affected at the same time—a fact which is not in accord with the usual classic description of the disease.

It is well known that Strümpell, and later Medin, held that poliomyelitis and polioencephalitis are affections so intimately related that they may be combined in the same patient. In Zappert's cases this coincidence has not been noted, though the statistics of the polyclinic for 1898 show that such nervous affections as idiocy, atrophy of the optic nerve, convulsions, etc., were nearly doubled in that year over the average of previous years. No relation could be deduced between the increase in infantile palsy in 1898 and the extension of cerebro-spinal meningitis during the same year. The importance of the exciting causes to which infantile palsies have been attributed is carefully investigated. In five cases the palsy was said to be of congenital origin, but of the five only one presented satisfactory evidence of authenticity. This could be explained by the existence of a hemorrhage at the level of the anterior horns produced during birth; or one might admit the existence of a progressive muscular atrophy of the Werdnig-Hoffmann type. The question could not be decided except by the subsequent progress of the case. For the present Zappert leaves in doubt the existence of a congenital anterior poliomyelitis.

Traumatism was the imputed cause in five cases, but in two only was it admissible. Such cases are probably due to ascending neuritis with secondary lesion of the cord, or to lesion of the anterior horns by concussion provoked by the traumatism.

The influence of cold, violent impressions, muscular fatigue and heredity has never been satisfactorily established. The infectious diseases, however, play a very important rôle. Of the thirty cases in which the previous occur-

rence of an infectious disease was mentioned, in five infantile palsy followed after a brief interval or even directly. Of these measles was mentioned twice, scarlatina once, and diphtheria twice. Under these conditions the infectious disease must act in one of two ways: either it increases the virulence of the specific agent which we have not as yet isolated, or the clinical picture of infantile palsy as well as its lesions can be produced by various morbid agents or their toxins. It is possible that the infectious disease may act by producing an ascending neuritis which produces a lesion of the cord of which the palsy is the clinical expression.

A Study of the Plantar Reflex in Infancy.—JOHN LOVETT MORSE (*Pediatrics*, 1901, vol. xi., No. 1) has presented a study undertaken to determine, if possible, whether or not the plantar reflex is present in infancy; if present, its character; and if absent in early infancy, at what age it is developed; and, incidentally, it was hoped that something might be learned as to the value of the Babinski phenomenon in the diagnosis of nervous diseases in infancy. Two hundred and fifty-four infants under two years of age, not suffering from any form of nervous disease, were examined as they presented themselves consecutively at the out-patient department of the Infants' Hospital, Boston.

The conclusions of the few observers that have studied the plantar reflex in infancy are somewhat at variance. Babinski found that in the new-born irritation of the sole of the foot normally caused extension of the toes. He attributed this to the imperfect development of the pyramidal tracts at birth, and considered it as a proof of the dependence of the toe phenomenon upon disturbance of the function of the pyramidal tract.

In the author's experiments a moderately sharply pointed orange stick was used, drawn, not too rapidly or too forcibly, from the heel toward the toes along the outer side and middle of the foot. Each foot was always tested several times in order to avoid error. The flexion of all or some of the toes was accepted as the flexor reflex; the extensor reflex was limited to the deliberate marked extension of the great toe, with or without extension or separation of the other toes. He draws attention to the point that dorsal flexion of the foot, including the toes, should not be mistaken for the extensor reflex, and thinks it probable that this has been mistaken by some observers for the true extensor reflex, which may explain the discrepancy in the results from various studies. Great difficulty was experienced in many cases in determining the presence or absence of a reflex because of the tendency of infants to hold their feet rigidly, and because of their almost constant purposeless movements.

The result of this study showed that in 35 per cent. of the cases there was no plantar reflex; in 7 per cent., no reflex on one side and flexion on the other; in 6 per cent., no reflex on one side and extension on the other; in 5 per cent., flexion on one side and extension on the other; in 25½ per cent., flexion on both sides; in 21½ per cent., extension on both sides. Further analysis showed that the reflex was absent on both sides much more often in the first than in the second year, and much more frequently in the first nine than in the last three months of the first year. It also shows that extension on both sides was much more frequent than flexion on both sides during the

first nine months, while the condition was reversed after this age. Extension on one side with flexion on the other, and extension or flexion on one side with no reflex on the other occurred with about equal frequency at all ages. Dorsal flexion of the feet and marked drawing up of the legs were not uncommon reactions in the first year, but occurred very rarely in the second year. To state this definitely it may be said that in the first year extension on both sides was much more frequent than flexion on both sides, but there was no reflex in as many cases as in the two other classes combined (41 per cent.). In the second year, while there was no reflex in 15 per cent. of the cases there was flexion on both sides in 57½ per cent. and extension on both sides in only 9 per cent.

It is evident from this study that there is no constant plantar reflex in the first year, and that while the reflex approaches the adult reflex during the second year, it is still inconstant. It is also evident that since there is no constant reflex under normal conditions during the first two years, no conclusions can be drawn from the presence, absence, or character of the reflex in diagnosis of abnormal conditions of the nervous system at this age.

A Case of Lobar Pneumonia due to the Bacillus of Eberth.—TOLLEMER (*Société de Pédiatrie*, January 8, 1901; *Revue mensuelle des Maladies de l'Enfance*, February, 1901, p. 98) reports the case of a child convalescing from typhoid fever. When the temperature had been normal for several days, cough, dyspnœa, and pain in the side developed. On the fourth day the temperature reached 103°, and the classical signs of lobar pneumonia were easily recognized. Examination of the expectoration showed the presence of streptococci of low virulence and numerous typhoid bacilli. Pneumococci were not present. Examination of mucus from the pharynx made several days after recovery showed absence of typhoid bacilli.

Mixed Feeding of Infants.—JOHN ZAHORSKY (*Pediatrics*, March 15, 1901, p. 208) considers this subject under two headings: 1. Artificial feeding as an adjuvant to nursing. 2. Human milk as an adjuvant to artificial foods. Under the first head he considers first the usually stated conditions demanding the addition of artificial food—deficiency in the quantity of the mother's milk and deficiency in solid constituents. When the mother's milk contains an excess of proteids causing colic and indigestion he recommends the use of some food containing dextrinized gruel, condensed milk, or some food which contains dextrin, sugar, and starch, to be given immediately before nursing. The artificial food dilutes the breast milk, and the carbohydrates inhibit the decomposition of the proteids. When the human milk causes diarrhœa, whether there is some gastro-enteric infection or the milk possesses decided laxative qualities, a solution of dextrinized gruel administered before nursing acts very well. When constipation is a marked feature under breast feeding, in some cases a deficiency in fat exists, while in others, in which the milk is perfectly normal, the condition must be ascribed to excessive absorption of fat or to a congenital weakness of the muscular coat of the colon. Whatever the cause, in a great majority of cases additional feeding acts very happily. A milk mixture containing about 4 per cent. of fat, 1 per cent. of proteids, and 7 per cent. of sugar, given two or three times daily, is usually all that is necessary. Egg albumin has been found to be

very laxative for young infants, and an egg-water made with the white of one egg to ten ounces of water and sweetened with cane-sugar may be given two or three times daily in doses of a few ounces. Older infants (eight to twelve months) seem to digest this mixture perfectly, and the laxative effect is not so marked. Oatmeal gruel or one of the malted mixtures may be used in the older cases. In obstinate cases the administration of pure butter deserves trial.

Under the second heading of his paper the author insists upon the value of even a few ounces of human milk in the dietetic management of acute or chronic digestive diseases. For this purpose the milk of a woman who is advanced some months in the period of lactation is to be preferred, since her milk is less liable to prove too rich in solid constituents. The properties of this milk are both nutritive and therapeutic; it is a powerful stimulant to the digestive and absorptive functions of the gastro-enteric tract; it seems also to give strength and tonicity to the vascular system; it supplies antitoxic and bactericidal properties to the blood of the infant which struggles with some infectious process. In marantic conditions the addition of mother's milk, even in small quantities, to the food very quickly changes the clinical picture to one of improvement; or the baby may be given mother's milk exclusively for a few days, and artificial food gradually supplied; or mother's milk and artificial food may be given alternately. Mixture of the human milk with the artificial food in the bottle is preferred by the author. In the convalescence from acute gastroenteric infections the addition of a little human milk to the rice or barley water first employed will be of distinct advantage until sterilized cow's milk may be gradually substituted for it.

In rickets with marked nervous symptoms and in scurvy the temporary use of breast milk in as large a quantity as can be obtained offers very decided advantages over any form of purely artificial feeding.

Suppurative Cerebro-spinal Meningitis due to the Influenza Bacillus.—J. LANGER (*Jahrbüch f. Kinderheilkunde*, 1901, Band iii., S. 91) records the case of a boy, aged nine years, who was admitted to the service of Ganghofner (Prague) on the eighth day of an affection which had all the characteristics of a meningitis. The illness had begun with violent headache and prostration, with tendency to somnolence, and later vomiting and rigidity of the neck. Fifteen days before the appearance of these symptoms the father, mother, and brothers of the child had developed influenza.

Upon admission to hospital, beside the symptoms already noted, there were observed sluggishness of the pupils, the gun-hammer position, fibrillary contractions of the muscles, hyperæsthesia of the skin, abolition of knee-jerks, and a temperature of 99.8° F. A diagnosis of probable tuberculous meningitis was made. On the third day the temperature rose rapidly to 103.8°. Lumbar puncture yielded a purulent liquid which showed, beside fibrin, a large number of polynuclear leucocytes. These enclosed bacilli, which proved to be, after culture, the bacilli of influenza. A culture of nasal secretion made the same day gave only staphylococci and other micrococci. The day after the puncture the temperature fell, and the case went on to recovery. This case is thought to be the second in which the presence of Pfeiffer's bacillus has been clearly proven during life in the cerebro-spinal fluid in a case of meningitis. The first case of the kind was reported by Slawyk.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL,

AND

SMITH ELY JELLIFFE, M.D., PH.D.,

PROFESSOR OF PHARMACOGNOSY AT THE COLLEGE OF PHARMACY; CLINICAL ASSISTANT AT THE VANDERBILT CLINIC (COLUMBIA UNIVERSITY), NEW YORK.

Inappetence.—DR. IZSO HÖNIG states that it is in patients with a normal temperature and suffering from chronic diseases that this symptom requires attention. He presents two classes: (1) Those suffering from conditions causative of diminished or absent appetite—*e. g.*, anæmia, chlorosis, helminthiasis, enteroptosis, etc. Here the symptom and the cause must be treated. (2) Chronic diseases for which there is at present no direct treatment—*e. g.*, carcinoma and tuberculosis. Noting the use of bitters, the author proceeds to cite the unpleasant effects of orexin hydrochloride in producing so much burning and pain in the stomach that it often failed to excite the appetite. These effects are not so often seen after orexin tarmates and basic orexin, yet frequently these are not more certain to produce appetite than the bitters, and sometimes they fail altogether. Vanadin, in doses of from five to twenty drops thrice daily, especially in tuberculous patients, often gives good results. The theory is that this remedy, which is really a hyperoxygenated vanadium salt, parts with its excess of oxygen, and not only stimulates the stomach, but hinders fermentation. Later sodium metavadinate, in dose from one to five sixty-fourths of a grain, given before meals, has been recommended by several authorities. It should be administered with intervals of rest, and, as the remedy is practically tasteless, it is pleasant to take, and seems to be effective in improving the appetite, increasing the strength, and adding to the body-weight. Brilliant results have followed the use of electricity and massage of the stomach, but they quite as frequently fail. Of late krymotherapy—which consists of local application of intense cold—has attracted attention. Liquefied carbon dioxide is the means employed, liberated from its container into a linen bag the size of the stomach, and applied externally. Unpleasant symptoms, as pain and severe cold, have not been observed. After four or five days the appetite appears, and continues long after the cessation of treatment. This method seems the more certain of those mentioned in this paper.—*Klinische-therapeutische Wochenschrift*, 1901, No. 21, S. 686.

Acute Articular Rheumatism in Children.—DR. FRANK C. SIMPSON believes that although the salicylic compounds are still the principal remedies in the treatment of this disease they must be used sparingly in children, because they produce so much depression. In some instances sixty to one

hundred grains of salicylates may be taken before the stomach rebels. Oil of wintergreen is effective in some instances, but is objectionable because it upsets the stomach. The alkaline treatment following the use of the salicylates consists in controlling pain and fever and never affects the stomach. Rest in bed is the only safeguard against endocarditis. If this has become established, the patient must be kept in the recumbent position and small doses of opium administered.—*Pediatrics*, vol. xi. p. 247.

An Investigation of Colchicum.—Mr. Louis Schulze has made comparative usage of the root and seed. He finds for the seed an average of between 0.6 and 0.7 per cent.; for the root, between 0.4 and 0.5 per cent. colchicine. It would appear that the seeds are slightly richer in the alkaloid, and there appears to be no valid reason for the retention of the root in the pharmacopœia.—*American Journal of Pharmacy*, 1901, vol. lxxiii. p. 293.

Codeine.—Dr. G. Bardel finds from his physiological and clinical studies that codeine is not hypnotic. It depresses, but does not cause sleep. Attention is directed to the muscular enfeeblement, visual difficulties, slight vertigo, dry mouth, nausea, rarely vomiting, marked occipital headache, slow pulse, and sometimes slight contraction of the pupil, which doses of from three to six grains produce, but even with these amounts there is no tendency to sleep.—*Les Nouveaux Remèdes*, 1901, No. 10, p. 217.

Phosphorus Medication.—Dr. A. Martinet has reviewed the extensive literature, quoting much of recent date. He concludes: (1) Substances containing phosphorus (glycero-phosphates, lecithins, phosphoric acid) fix phosphorus in the organism. (2) They stimulate the multiplication of cellular elements—*i. e.*, the enlargement and division of nuclei and changes in multiplication. (3) They produce a general dynamogenic action. (4) Beside these properties phosphoric acid is anti-alkaline, antiseptic, and assists digestion.—*La Presse Médicale*, 1901, No. 44, p. 258.

Citrophen.—Dr. L. Freyberger states that this substance, which is chemically paraphenetidin citrate, is of considerable value as an antipyretic in fifteen-grain doses. As an antirheumatic it is decidedly inferior to sodium salicylate and salol. As an antineuralgic, its action is quick and persistent in headache, migraine, occipital and frontal neuralgia, menstrual headache, but it failed in one instance of inveterate trigeminal neuralgia. Three or four doses per day of the above-mentioned amount are sufficient.—*Treatment*, vol. v. p. 5.

Trional Poisoning.—Dr. M. Rosenfeld remarks that in the two instances where this drug (two and four drachms) was taken without suicidal intent (Collatz and Kramer) collapse only was observed; there was no hæmatoporphyrinuria. In the cases of Boyer and Hertwig, when large doses of both this and sulphonal were given, no hæmatoporphyrinuria resulted. To the fatal cases reported by Schultze, Geill, and Ruedy, the author adds one (a lunatic) when the dose was fifteen grains daily, but this was not taken regularly. After some months one death occurred. The diagnosis was based on

the vertigo, disturbed gait, absent reflexes, respiration of the Kussmaul type, hæmatoporphyrinuria, and the fact that the necropsy showed no cause for the fatal result other than the one assigned.—*Berliner klinische Wochenschrift*, 1900, No. 20, S. 547.

Erythral Tetranitrate in Lead Colic.—Dott. Mattirlo records the observation that in lead-poisoning arterial tension is high. In the present instance the pulse was hard and the sphygmographic tracing was characteristic. The remedy was administered in one-half grain dose. The results were that with the reduction of arterial tension there was a cessation of pain, and the patient slept. Two days later similar treatment during an acute attack was successful.—*Gazetta degli Ospedali e delle Cliniche*, 1901, No. 63, p. 671.

Gloncin.—Dr. H. Edwin Lewis finds that in all conditions of spasmodic contraction of muscular tissue glonoin is of marked service. In angina pectoris it is equalled by no other drug; for prompt relief the dose should be one-twenty-fifth of a grain followed by one-two-hundred-and-fiftieth of a grain every hour or two. It is useful to relieve the symptoms which accompany arterial sclerosis, delays the progress of senile gangrene and Raynaud's disease, and, used early, occasionally prevents their onset. In sciatica one-fiftieth of a grain combined with morphine will frequently give relief when the latter used alone is unsuccessful. Its continued use is recommended for relieving the high tension and pains of tabes dorsalis. In uræmic convulsions, combined with pilocarpine, it is of marked value. After citing various indications for its use, the author remarks that children seem to have a special tolerance for the drug, and several instances are on record where children have eaten a dozen or more of one-hundredth grain tablets without any poisonous effects whatever. In cholera infantum, with pronounced nervous symptoms, or when the skin becomes cold and clammy, this remedy is a life-saver in frequently repeated doses of one two-hundred-and-fiftieth of a grain.—*Merck's Archives*, 1901, vol. iii. p. 164.

Therapeutic Use of Oxygen.—Dr. E. Aron, from clinical observation, concludes that in chlorosis the results are absolutely negative. In some instances of cardiac or pulmonary dyspnœa they have been slightly favorable, but often the improvement ceased so soon as the inhalations were suspended; possibly, suggestion was partly responsible. In syncope, as in morphine-poisoning, oxygen is not to be compared with artificial respiration. It is only in poisoning by carbon monoxide that oxygen inhalations are really indicated. Inhalations are also useful in aniline poisoning, and to counteract the disturbances produced by rarefied air. Manometer experiments show that oxygen renders the respiration more frequent and more superficial.—*La Semaine Médicale*, 1901, No. 21, p. 165.

Treatment of Pneumonia.—Dr. Leonard Weber in asthenic pneumonia gives hypodermically nitroglycerin, one-fiftieth of a grain; strychnine, one-thirtieth to one-twentieth of a grain, and camphor oil, one-half drachm. Alcoholic pneumonias receive ammonium carbonate or the anisated solution

of ammonia every two or three hours, or camphor, one or two grains with benzoic acid, three to five grains in capsule, every three hours. For delirium tremens symptoms, strychnine, one-twentieth of a grain, and apomorphine, one-twentieth of a grain, may be given hypodermically three or four times daily. In septic pneumonias alcoholic stimulants in large doses (two ounces of whiskey) every three or four hours are indicated. In case of delayed resolution ten drops of turpentine every two hours in emulsion is highly recommended. A hot mustard bath is deemed to be of value in the pneumonias of children. A pound of mustard is diffused in a baby's bath tub of water at 105° F. The duration of the bath is ten minutes with friction. —*Post-Graduate*, vol. xvi. p. 525.

Therapeutic Management of Typhoid Fever.—Dr. Aurete Nadeau finds excellent results from the administration of calomel, because (1) it is a germ destroyer and local antiseptic of the first order. (2) It is a purgative, and by producing copious stools, full of bile, serves as a scavenger of the intestinal tract. (3) Bile is a physiological bowel antiseptic, and the stimulant of its healthy antisepsis. (4) Absorbed in small quantities, calomel increases leucocytosis, the reserve force of nature in time of trouble. (5) It is an unquestioned diuretic. Important as it is in the initial stage calomel may become harmful later on as an irritant at a period when purgatives could prove dangerous to the ulcerated follicles and Peyer's glands. Therefore, even in small doses, it is contraindicated after the first week. Now, betanaphtol in eight-grain and bismuth salicylate in four-grain doses three to twelve times daily may be administered. Since the betanaphtol may irritate the kidneys benzonaphtol can be substituted for it. Some other bismuth preparation may be substituted for the salicylate. Antipyretics with this treatment are usually not indicated; those of the coal-tar series are prescribed. Sodium salicylate is useful in typhoid fever as an antipyretic, but its use should be limited to one or two doses daily.—*Merck's Archives*, 1901, vol. iii. p. 8.

Typhoid Fever in Children.—Dr. Henry Dwight Chapin reports six instances (five recoveries). The treatment was generally alcohol sponge baths for high temperature, nitroglycerin or strychnine for stimulation, clearing of bowels with calomel, followed by disinfection by chlorine water or hydrochloric acid with a diet of peptonized milk and gruels.—*Post-Graduate*, 1901, vol. xvi. p. 445.

Fermentative Conditions Associated with Chronic Gastritis.—Dr. John C. Hemmeter believes that treatment should be directed toward restoring the motor functions. When fermentation is marked nothing can take the place of lavage; the gastric spray is useless. Introgastric electricity is useful to restore the lost muscular tonicity; a strong faradic current in high tension, the positive pole within the stomach and the negative alternately in the epigastrium and over the spine. The best results are obtained by a faradic current equal to that of one groove cell freshly prepared, sending four stimulations into the stomach in one second. The galvanic current is more useful in allaying gastric pains. It is well to exclude carbohydrates

from the diet entirely for a time and to nourish the patient exclusively by proteid food in a finely divided state (scraped beef, Hamburg steak, sweetbreads, fish, calves' brains, egg albumin, gelatin). All food should be so served that it requires very little mastication. If there is an absence of free hydrochloric acid after test-meals, this should be supplied in gelatin capsules during and after meals.—*International Medical Magazine*, 1901, vol. x. p. 321.

DR. ALLEN JONES knows of no remedy for gastric fermentation which compares in efficiency with the following: Cerium oxalate, 1; bismuth subcarbonate, 2; calcined magnesia, 4 parts. Of the mixture, one-half to one teaspoonful should be given, stirred in a quarter of a glass of water, at 10 A.M., 3 P.M., and 9 P.M., or thereabouts as to time. Flatulency subsides, gastric discomfort disappears, and the bowels are usually opened, at times too much so, when the dose should be reduced.

DR. CARL VON NOORDEN gives a full tablespoonful of chloroform, 1, in water, 50, immediately after lavage. The lavage should be practised in the evening two hours after the last meal. In the beginning of treatment the stomach should be washed out in the morning for a few days. Two-and-one-half to three grains of thymol are administered in wafers after each meal.—*Ibid.*, pp. 342, 345.

The Use of Ice Per Rectum in Narcotic Poisoning.—DR. WILLIS CUMMINGS notes that ice introduced into the rectum produces very promptly temporary return to consciousness in opium-poisoning. Instances are reported of chloral, coal gas, and strychnine-poisoning in which ice was successfully used. Immediate results have been claimed in alcoholic coma, "supposed diabetic coma," coma from ascites with cardiac insufficiency. When instant stimulation of the vasomotor or sympathetic centres is needed ice per rectum will be found an efficient aid.—*Merck's Archives*, 1901, vol. iii. p. 86.

The Use of the Suprarenal Capsule in Diseases of the Heart.—DR. SAMUEL HOERSCHEIM, from an analysis of the histories of one hundred patients, reaches the following conclusions: After the administration of the suprarenal powder the following was observed: (1) A weak and irregular acting heart became stronger and more regular; (2) a dilated heart was contracted; (3) a diffused apex-beat became localized; (4) a diffused, loud, and rough mitral regurgitant murmur became localized, smoother, and lessened in intensity, while in some cases the murmur disappeared; (5) a murmur which, owing to the extreme weakness of the heart, could scarcely be heard, became more distinct, thus aiding in the diagnosis; (6) the normal cardiac sounds, when distinct, became clearer and more easily distinguished; (7) in some cases a rapid pulse became less rapid; in other cases a slow pulse became faster; (8) patients who were very weak, with organic heart disease, were improved; (9) no effect was observed in organic heart disease when the pulse was strong and regular.—*New York Medical Journal*, 1901, vol. lxxiii. p. 847.

Resorcin as a Preservative for Suprarenal Extract Solution.—DR. SEYMOUR OPPENHEIMER, after experiments with boric acid, camphor, glycerin,

mercuric chloride, silver salts and alcohol, recommends a 1 per cent. aqueous solution of resorcin. To each ounce of this solution sixty grains of the desiccated suprarenal extract are added. The quantity necessary for daily use is filtered, and thus a clear solution is obtained.—*Laryngoscope*, vol. x. p. 187.

Treatment of Burns in Infancy and Childhood.—Dr. Charles Warren Allen, for local application for burns of the first and second degrees, knows nothing better than a 1 per cent. aqueous solution of picric acid. This gives almost immediate relief from pain, and healing takes place rapidly. After the burned area has been coated once or twice with the solution a thin layer of absorbent cotton may be applied dry, and over this a layer of impervious tissue, and, finally, as much cotton as may be required for warmth, protection, exclusion of air and germs, and over this a loose bandage. The pain of erythematous areas may be greatly relieved by local baths containing potassium nitrate or bicarbonate in saturated solution. When there are raised water blisters these may be carefully cut away at the edge, and a layer of cotton soaked in a saturated solution of potassium chlorate to which a little glycerin is added may be applied over the wound. In deep and extensive burns a permanent bath offers one of the best means of securing comfort. Among soothing remedies the old "carron oil" is the best known, and probably most extensively used. It has the advantage of being easy of preparation from ingredients easily obtained. It is well to add some antiseptic and boric acid powder (5 per cent.), thymol (1 to 1000), carbolic acid (1 to 500), or orthoform (1 per cent.) are recommended. An important point is to refrain from removal of the dressings. If this layer of gauze, cotton, or cheese-cloth comes next the wound these need not be taken up, but the application may be applied over and through the dressings.—*Pediatrics*, 1901, vol. xi. p. 224.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE; PROFESSOR OF OBSTETRICS AND DISEASES OF INFANCY IN THE PHILADELPHIA POLYCLINIC; CLINICAL PROFESSOR OF DISEASES OF CHILDREN IN THE WOMAN'S MEDICAL COLLEGE; VISITING OBSTETRICIAN TO THE PHILADELPHIA HOSPITAL, ETC.

Syncytioma Malignum.—In the Edinburgh *Medical Journal*, May, 1901, MacKenna contributes an article in which he has collected the statistics of 78 cases. The average age of the patients was thirty-three years, and in most of them a hydatid mole or abortion had preceded the development of the disease. In 38 cases hydatid mole preceded parturition at term in 24, abortion in 15, and premature labor in 1. The disease made its appearance in 6.9 weeks after delivery at term, in 11.4 weeks after abortion, and in 10 weeks after hydatid mole. As regards metastases, in 33 the lungs were

affected, the vagina in 17, the spleen in 8, the liver in 6, the kidneys in 6, and the ovaries in 4. The broad ligaments, pelvic connective tissue, bladder, mesentery, femur, and brain were each affected in two cases.

[The reviewer reported in the *American Journal of Obstetrics*, July, 1900, a case of syncytioma malignum with metastases in the brain, liver, kidneys, and lungs, in which the uterus and pelvic organs were unaltered. This case has been overlooked by MacKenna in his paper.]

Cæsarean Section.—CRAGIN (*Medical Record*, May 4, 1901) reports nine Cæsarean sections during the last three years at the Sloane Maternity. One of these cases was the removal of the entire uterus for cancer, and proved fatal. Six of the nine were Sänger Cæsarean cases, and two were hysterectomies. With the exception of the case of cancer the patients did well.

He believes that Cæsarean section is preferable to symphysiotomy, and that the operation should be extended to private houses. In his last operations catgut only was used for suture, the broad ligaments were compressed by the hands of an assistant, and the uterus was stimulated to contract by hot saline solution. The omentum was placed over the uterus before closing the abdomen.

The Lower Uterine Segment.—SMYLY (*British Medical Journal*, May 18, 1901) contributes an interesting paper upon this subject. He finds in existence four theories regarding the lower uterine segment: One, that it develops during pregnancy from the lower part of the body of the uterus; another, that it develops from the upper part of the cervix; a third, that it is formed from the cervix uteri, and a fourth, that it is developed from both the body and the cervix. It seems probable to him that it is developed from the upper portion of the uterus during pregnancy.

He calls attention to its clinical importance during labor, and believes that it prevents the rupture of the membranes by receiving a part of the force of the uterus which otherwise would be expended upon the membranes. During the third stage, when the uterus expels the placenta from the contractile portion, the lower segment becomes distended and can be easily felt above the pubis. In delivering the placenta, it is best to wait until the uterus has separated it from its wall and until it can be appreciated in the lower uterine segment above the pelvic brim. In abnormal labor, if the lower segment be badly developed, the force of pressure is received by the membranes, which rupture prematurely.

When the lower segment is closely applied to the fœtus, as in normal cases, it is impossible for the umbilical cord to prolapse, no matter how contracted the pelvis may be. In deformed pelves the cord will not prolapse so long as the lower uterine segment remains tightly applied to the presenting part. It is not the contour of the pelvis which determines the prolapse of the cord but the presence or absence of the uterine segment.

In placenta prævia he advises the treatment proposed by Robert Barnes. He would rupture the membranes, bring down a foot, and allow the case to proceed naturally. While this method sacrifices the child in many cases it is safest for the mother, and most efficient. In cases where the head has passed through the cervix, it can better be delivered by forceps. Where the

os is not sufficiently dilated to admit two fingers, this sort of version cannot be carried out. He has never seen a case of placenta prævia in which two fingers could not be carried through the os and cervix, and the condition must be a very rare one.

In rupture of the uterus the lower uterine segment becomes extraordinarily thinned, and the fœtal part can be felt through the uterine tissue with remarkable plainness.

It occasionally happens that the contraction ring at the junction of the upper and lower segments of the uterus forms an obstacle to labor. The use of narcotics and patient dilatation with the hand are usually sufficient in these cases.

The Dangers and Diagnosis of Breech Presentation.—In the *British Medical Journal*, May, 1901, SPENCER calls attention to the dangers of breech presentation to the fœtus. In twenty-six cases in which he made an autopsy upon the fœtus, hemorrhage had taken place into the kidney to such an extent that had the child lived the kidneys must have been permanently damaged. This suggests the necessity for caution in making pressure upon the region of the kidneys during the delivery of the child. Hæmatoma of the liver and injury to the lungs may also result in these cases. Hemorrhage into the mucous membrane of the uterus may result from pressure in breech presentation, and is sometimes mistaken for menstruation in infants. In children delivered by the Prague method, hemorrhage into the muscles of the neck is often seen. Damage to the brachial plexus and injuries to the bones and joints are sometimes observed.

In diagnosticating breech presentation the bladder and bowels of the patient should be emptied. She should lie upon her back along the edge of a couch or bed with the shoulders and head somewhat raised. Auscultation is especially valuable in these cases, as the heart-sounds are heard higher than in vertex presentation. By palpation the head is not found in the lower uterine segment, but can be detected at the other extremity of the uterus. In one form of monstrosity, anencephalic fœtus, palpation fails to reveal the diagnosis. In this instance the fœtal head is no larger than the breech.

The diagnosis having been made, Spencer urges that external version be performed. It is rare that an anæsthetic is required, and usually the fœtus can be turned with little difficulty. An abdominal belt may be worn to prevent the recurrence of the abnormal presentation. One-fifth of such cases occur in multiple pregnancies, with a mortality of 12.7 per cent.

The operation of external version should not be attempted in a considerably flattened pelvis where the fœtus is dead, the uterus malformed, or placenta prævia is present. The operation may fail if the cord has been wound about the child's neck or if fibroid tumors of the uterus are present. Ordinarily, however, it does not offer especial difficulty.

The Management of Labor Complicated by Chronic Heart Disease.—In the *Birmingham Medical Review*, February, 1901, POSS contributes a paper upon this subject. He finds that aortic lesions are less serious, with a mortality ranging from 11 to 23 per cent., than mitral lesions, whose mortality is

given in stenotic cases as from 46 to 64 per cent. The fœtus suffers worse in mitral cases. Death of the mother occurred most frequently during the second stage of labor or in the early puerperium. In aortic cases the patients are worse during pregnancy, and when labor is ended rapidly improve. In mitral cases unfavorable symptoms may develop at any time, attain a maximum during labor, and do not disappear during the puerperal condition. The heart-sounds are often not altered in these cases, and hence the physician may overlook the condition present. Usually these patients have much discomfort in the early months of pregnancy, which grows less toward the middle of gestation and becomes worse toward the end. Labor, however, should not be induced, as it results disastrously in most cases.

At the time of labor danger arises to the mother because with the removal of the child and appendages the blood-pressure is altered, the pressure in the aorta sinks, and the venous pressure increases. An unsound heart cannot accommodate itself to these changes.

The management of labor with these patients consists in delivering them as promptly as is safe. Anæsthetics should be used with caution, and the placenta should not be delivered by expression, but manually. Nitrite of amyl during labor is especially useful.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,

OF NEW YORK.

ASSISTED BY

WILLIAM E. STUDDIFORD, M.D.

Vaginal Operation for Retroflexion.—SCHÜCKING (*Centralblatt für Gynäkologie*, 1901, No. 14) criticises all the common operations for the cure of retro-displacement from an obstetrical stand-point, including shortening of the round ligaments, vaginofixation and ventrofixation. He has abandoned his former operation in favor of the following procedure: After opening the vesico-uterine pouch the uterus is sharply anteflexed, retro-uterine adhesions being stretched or separated. A curved needle, devised by the writer, is passed through the broad ligament just below the origin of the round ligament, and is carried around the posterior aspect of the uterus to emerge at a corresponding point in the left broad ligament. When this is tied the uterus is anteflexed. The surface at the angle of flexion is freshened with a curette. The peritoneum becomes adherent at this point, and thus maintains the uterus in its normal position, without impairing the mobility of the organ. Five successful cases are reported, although there has been no opportunity to note the influence of pregnancy.

[It would seem as if the same objections could be urged against this operation as apply to other methods of vaginofixation—that it interferes with the

normal development of the pregnant uterus. The evidence is insufficient to justify any positive opinion in its favor.—H. C. C.]

Medullary Anæsthesia in Gynecology and Obstetrics.—STANKIEWICZ (*Czasopismo Lekarskie; Centralblatt für Gynäkologie*, 1901, No. 14) reviews the literature of spinal anæsthesia and reports six cases of major and minor gynecological operations, in one of which anæsthesia was only partial. He does not approve of this method in the case of hysterical patients.

Double Hypertrophy of the Breast.—BARTEL (*Zeitschrift für Heilkunde*, Band xxi., Heft 7) has collected fifteen cases of double and five of unilateral hypertrophy of the breast, which he divides into two classes—those occurring at puberty and those in pregnant women. In the first class the affected breast presents the ordinary structure of a mammary adenoma; in the second, the appearance of the normal gland during lactation.

In a case reported by the writer the patient was fourteen years of age and had not menstruated. The hypertrophy of the breasts followed an attack of pneumonia in her eleventh year. They extended from the second to the ninth rib on either side. Two operations were performed, the combined weight of the two masses removed being over four pounds.

Ultimate Result of Radical Operation for Carcinoma Uteri.—JACOBS (*Revue de gyn. et de chir. abdom.*, 1900, No. 4) reports fifty-two cases with four deaths. Of those patients who recovered sixteen had died from a return of the disease; sixteen had a recurrence, and sixteen were in good health. The writer recommends a radical operation only in those cases in which the disease is strictly confined to the cervix. The indications are a healthy vagina and parametric tissues and a movable uterus.

When the mucous membrane of the canal is involved, as well as the submucous vaginal tissue and broad ligaments, high amputation should be performed.

OTTO (*Centralblatt für Gynäkologie*, 1901, No. 14) has collected the statistics of several Danish hospitals. One hundred and sixty-three cases are reported. Vaginal hysterectomy was performed one hundred and thirteen times, with twenty-four deaths, fifty-nine recurrences before five, and four after five years. The uterus was removed per vaginam nineteen times for cancer of the body of the organ, with two deaths and six recurrences. Nineteen high amputations were followed by sixteen recurrences within two years.

[The striking variation in the results described in these two papers can only be accounted for by a wide difference in the technique of the operation, as well as care in the selection of cases. It would certainly be most unfair to judge of the results of the modern treatment of cancer of the uterus by the unfavorable Danish statistics.—H. C. C.]

Atmokausis and Zestokausis.—PINCUS (*Centralblatt für Gynäkologie*, 1901, No. 16) reviews the subject in an extended paper in which he emphasizes the value of this method of treatment especially in cases of uterine hemorrhage which have resisted curettement. He affirms that no

surgeon is justified in removing the uterus in cases of uncomplicated climacteric bleeding until atmokausis has been tried. It is also of great value in cases of interstitial fibroid in which radical operation is contraindicated.

Atmokausis is recommended in menorrhagia with subinvolution, because of its marked effect in reducing the size of the uterus.

The Action of Steam on the Uterine Mucosa.—KOSLENKO (*Centralblatt für Gynäkologie*, 1901, No. 17) describes the results of his experiments on dogs. Under anæsthesia the abdomen was opened, the anterior vaginal fornix was incised, and the cervix was drawn upward so that a tube connected with a steam boiler could be inserted into it. Through an incision in one horn of the uterus a thermometer was introduced into its cavity; at the same time the opposite cornu was isolated from the uterine cavity by passing a silk ligature around it.

With a pressure of 0 atmospheres in the steam-kettle the temperature of the uterine cavity rose to 100° C. and remained at that height for five or six minutes, when it slowly declined. When the pressure was raised to two atmospheres it reached 115° C., but fell in a few seconds. Strong uterine contractions were observed. The uterine muscle after a few seconds became pale, then grayish-red, and finally gray, showing that necrosis had occurred.

In a second series of cases uteri were extirpated at various intervals after atmokausis had been used for twenty seconds with a pressure of two atmospheres. On the first day partial destruction of the mucous membrane was observed; on the third day the necrotic areas were well defined; on the sixth the dead tissues were thrown off, and on the ninth regeneration of the endometrium had occurred.

The deeper portions of the glands were not affected, hence the rapid renewal of the mucosa. By controlling the pressure and the duration of the exposure any desired effect could be obtained, even obliteration of the uterine cavity.

Pulmonary Embolism following Myomectomy.—MICHEL (*Revue de gyn. et de chir. abdom.*, 1900, No. 4) believes that post-operative thrombosis is to be apprehended especially in the case of patients with large impacted tumors, who have been exhausted by loss of blood. Thrombosis of the pelvic veins is more dangerous than in those of the lower extremities. Persistence of rapid pulse after operation, with a low temperature, is the only symptom which might cause a suspicion of thrombosis. When this is noted the patient should be kept absolutely quiet in bed for several weeks.

Before any gynecological operation is performed a careful examination of the vascular system should be made, and if the patient has a rapid pulse, enlarged, resistant veins and œdema of the lower extremities it is wise not to operate.

Metastases in Cancer of the Cervix Uteri.—KUNZE (*Centralblatt für Gynäkologie*, 1901, No. 17) reports a case of epithelioma of the cervix with atresia of the os internum and resulting pyometra. After extirpation of the uterus numerous metastases were found in the corporeal endometrium. The parametric tissues were apparently free from disease.

Retroperitoneal Pelvic Tumors.—WINTERNITZ (*Centralblatt für Gynäkologie*, 1901, No. 17) describes two cases, one in which the tumor was a papillary cystoma presenting the ordinary appearance of an ovarian cyst, though no traces of follicles could be found in its wall. It was supposed to have developed from some aberrant cells, as there was no reason to infer the presence of a third ovary.

KRÖNIG (*Ibid.*) removed a subperitoneal retro-uterine tumor, leaving the uterus and both ovaries and tubes intact. It was a multilocular cystoma, which the writer inferred had developed from the remains of the Wolffian body, at first in the posterior wall of the uterus, but later being displaced into the cellular tissue of Douglas' pouch.

Ultimate Results of Vaginal Extirpation of the Cancerous Uterus.—REIPEN (*Centralblatt für Gynäkologie*, 1901, No. 17) presents the statistics of the Halle clinic up to 1897; 25.14 per cent. of the patients were free from recurrence. Between 1887 and 1900 there were 303 operations with twenty deaths (6.6 per cent.). Injuries to the bladder and ureters occurred in 8.91 per cent.

Infiltration of the parametric tissues as far as the pelvic wall and also of the bladder wall were regarded as positive contraindications to operation. One-third of all the cases received at the clinic were considered as operable.

The abdominal route is condemned, since with the improved modern technique the mortality is still 20 per cent.

Surgical Treatment of Procidentia.—CHRISTIANI (*Zeitschrift für Geb. u. Gyn.*, Band xliii., Heft 2) reports 143 cases of procidentia operated upon in the course of five years, 84 per cent. of which were kept under observation subsequently. In the majority of the cases colpo-perineorrhaphy and ventrofixation were performed. Of 83 patients thus treated 76 per cent. were permanently cured, while 87 per cent. were able to attend to their usual occupations—a result which has not been shown in any other similar series of cases.

Extension of Uterine Cancer through the Lymphatics.—PUPPEL (*Centralblatt für Gynäkologie*, 1901, No. 13) publishes the result of his histological studies in this field. He found that in cancer of the portio vaginalis those lymph-spaces are first affected which run in the middle muscular layer. The disease then extends either to the vagina or through the lymphatics to the parametrium. Metastases in the body of the uterus occur late, after the broad ligaments have already been affected, also through the medium of the lymph spaces in the middle and outer muscular layers.

As a practical deduction from these observations the writer recommends that supravaginal amputation be performed in old women in cases of operable carcinoma of the portio. If the posterior lip is involved he advises extensive removal of the parametric tissues. If the disease has extended as high as the os internum total extirpation is necessary.

Sensitiveness of the Peritoneum.—LENNANDER (*Centralblatt für Chirurgie*, 1901, No. 8), as the result of a series of experiments, concludes that

while the stomach, intestines, mesentery, gall-bladder, and possibly the kidneys and liver do not receive impressions of pain, touch, heat, and cold, the parietal peritoneum is exceedingly rich in sensory nerves. Intestinal colic, he believes, is due to sudden stretching of these nerves associated with distention of a loop of intestine. Moreover, adhesions only give rise to pain when they cause a certain amount of stretching of the peritoneum. In acute peritonitis the extreme sensitiveness of the anterior abdominal wall on pressure is due almost entirely to the inflammation of the anterior parietal peritoneum.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

EDWARD JACKSON, A.M., M.D.,
OF DENVER,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,
PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

Glaucoma Induced by Cocaine.—J. HINCHELWOOD (Glasgow) reports the case of a woman, aged fifty years, suffering from asthenopia, in whom cocaine was used to dilate the pupils to obtain a good view of the fundus of the eye. A few hours later the eye became painful, and next morning presented the typical clinical picture of acute glaucoma. Eserin, followed by iridectomy, restored the normal tension of the eyeball, but not her previous normal vision.—*Ophthalmic Review*, November, 1900.

S. SNELL (Sheffield) reports a similar case, in which the cocaine had been prescribed to relieve discomfort of the eye, and a 1 per cent. solution had been instilled three times during the day. Eserin and iridectomy secured a satisfactory recovery of vision.—*Ophthalmic Review*, February, 1901.

[These cases illustrate very clearly the connection of mydriatics with glaucoma. The mydriatic excites glaucoma, because it dilates the pupil in an eye having a glaucomatous structure—that is, an anterior chamber so narrowed that the crowding of the retracted iris into the angle obstructs the outflow channels and so raises the tension of the eyeball. Cocaine is frequently used in the treatment of glaucoma, but for this purpose should always be combined with a myotic strong enough to prevent it from dilating the pupil. In such a combination its tendency to contract the vessels of the iris and render the iris thinner aids in opening the outflow channel, thus reducing the tension. But it should be remembered that the anæmia produced by cocaine is quite brief, and is followed by some tendency to hyperæmia. So that even combined with a myotic it should be used in glaucoma with great caution.

The diagnostic value of a mydriatic in glaucoma which I have before urged (see this JOURNAL, April, 1898) is also illustrated in the above cases. The

possibility of glaucoma had been suspected in one of them, in the other it had not. The use of the cocaine gave unmistakable evidence of such a condition; then the iridectomy permanently cured the glaucoma. If the cocaine had not been used the glaucomatous process, following its common course, would probably have permanently damaged vision to a very serious degree before it was discovered, and when discovered might have been far less amenable to treatment.—ED.]

Tobacco Amblyopia.—C. E. SHAW (Belfast, Ireland) reports a case of well-marked toxic amblyopia in a boy, aged fifteen years, who had smoked cigarettes from the time he was eight years old. He also reports a case in a man, aged forty years, who smoked but one or two ounces of tobacco a week, having decreased his indulgence by one-half a year previously.—*Ophthalmic Review*, May, 1901.

[The great mass of cases of tobacco amblyopia occur after the age of forty, similar cases occurring earlier being largely due to alcohol; but in relation to poisoning we always have to remember that individual susceptibility is the supreme factor and capable of breaking all rules.—ED.]

J. H. FISHER (London) calls attention to the well-established observation that nicotine destroys the power of ganglion cells to transmit impulses. Professor Langley found that painting a ganglion with nicotine produced the same effect as injecting the drug into a vein. Stimuli applied on the proximal side of the ganglion or to the ganglion itself produced no effect; applied to the distal side of the ganglion they still proved efficacious. Painting of a nerve trunk with nicotine does not prevent the transmission of impulses. To explain the central scotoma of tobacco amblyopia, Fisher offers the supposition that visual impulses from the macula pass through the ganglion cells of the retina, while those coming from peripheral parts of the retina pass along more direct nerve paths without having to go through ganglion cells. He refers to the crowding of ganglion cells in the region of the macula and their comparative scarcity in the more peripheral parts.—*Ophthalmic Review*, June, 1901.

Ophthalmoscopical Changes in Pneumonia.—A. PETERS (Bonn) reports the case of a man, aged twenty years, who, during a rather light attack of pneumonia, noticed impairment of vision of the left eye. One month later he applied on this account, presenting a subsiding iritis. A mydriatic dilated the pupil except for two slender adhesions. The ophthalmoscope revealed evidence of a recent chorio-retinitis, involving the region around the optic disk, in which were seven large rounded, ill-defined, light-gray, prominent spots. Similar lesions were observed in a case reported by Fraenkel. Peters also reports one in which the spots were more sharply defined; but the fact that the pneumonia was complicated by tuberculosis rendered the nature of the lesions doubtful. The explanation offered regarding such lesions is that they arise from a pneumococcus embolism.—*Klinische Monatsbl. für Augenheilkunde*, May, 1901.

Malarial Diseases of the Cornea and Iris.—A. LE PRINCE (Bourges), although admitting these are much more rare than malarial diseases involv-

ing the retina and other deep structures of the eye, regards them as of considerable importance. They include iritis, a form of diffuse parenchymatous keratitis, and a form of corneal ulcer which he regards as identical with dendritic keratitis. He reports a case of the latter occurring in a woman, aged twenty-four years, shortly after confinement. The ulcer had the characteristic branching form, and improvement followed rather promptly upon the administration of quinine and arsenic.—*Annales d' Oculistique*, May, 1901.

[Le Prince makes no reference to what seems to be an important feature of these cases: the disturbance of the nerve-supply of the part. The sensibility of the cornea as tested with the twisted pledget of cotton is often, perhaps always, markedly diminished. We have recently seen a case in which this impairment of sensibility was confined to a segment of the cornea, and upon this segment all the ulcers were situated.—ED.]

Economic Valuation of Vision.—H. V. WURDEMANN (Milwaukee) discusses this extremely important and complicated subject, employing in the main the formulas suggested by Magnus. Absolutely perfect visual acuity is very rarely demanded to follow any occupation, while certain occupations require less than others. Wurdemann separates the common forms of employment into two groups: one requiring visual acuteness equal to 75/100 as the best condition or full ability for pursuing them, and for which vision of less than 15/100 constitutes total disability. In the second group vision of 50/100 gives full ability, and of 5/100 complete disability. For instance, a person whose acuteness of vision was reduced to 40/100 would, for occupations of the first group, possess an earning capacity of only 5/12, while for an occupation of the second group his earning capacity would be 7/9. For the first group the loss of one eye entails a loss of 30 per cent. of earning ability for the first year, and of 20 per cent. afterward; while for the second group the losses would be respectively 27 per cent. and 18 per cent. Limitation of the field of vision is also an important factor in damage to earning capacity. To exactly estimate the damage in the individual case the present earnings and also the probable future earnings must be considered. In this way the patient's age becomes an important element in the calculation. In actual practice still other circumstances, as contributory negligence, expense, and suffering incurred, etc., will also influence the estimate.—*Annals of Ophthalmology*, April, 1901.

[The just estimate of damage from loss of vision must always remain a difficult and complicated problem; but the larger the number of elements that can be estimated with mathematical exactness the better prepared will we be to properly weigh considerations that cannot be so stated. The reign of pure empiricism and mere whim in the estimation of damages will be shortened by such discussions, and all who are called upon to form such estimates, as in the rating of pension cases and the adjustment of compensation for accidental injuries, should carefully read this discussion in the original, since in many things it cannot be condensed.—ED.]

Congenital Condition Simulating Choked Disk.—C. H. BEARD (Chicago) reports a case in which the optic nerve entrance was entirely hidden in both eyes by a swelling of fully eight diopters. Careful investigation revealed

no evidence of brain disease or other probable cause of optic neuritis. The patient has remained under observation for seven years without noticeable change in the ophthalmoscopic appearances, with no deterioration of vision, and now seems to be in perfect general health.—*Ophthalmic Record*, June, 1901.

[Cases of this character are of great importance on account of the risk of mistaking such a condition for optic neuritis, significant of grave cerebral or constitutional disease. Others of the kind have been from time to time reported, but none quite so pronounced as Beard's. Prolonged observation may be required to settle the question raised by such a case; but if one bears in mind that this anomalous condition may exist its true character may be suspected from the first examination. The important diagnostic point is the calibre of the retinal vessels. In choked disk the arteries are small, the veins dilated. This relative or absolute enlargement of the retinal veins is not absent in a case of optic neuritis from the time the distinct swelling of the optic disks begins until it passes over into a condition of optic atrophy. The excellent colored plate which accompanies Beard's article shows the absence of this symptom of choked disk, and when he first saw the patient he noted that "all the retinal vessels were a trifle smaller in calibre than is normal."—ED.]

Methyl Alcohol Amblyopia.—G. E. DE SCHWEINITZ (Philadelphia) reports a case in which the pathway of entrance of the poison was through the lungs and the cutaneous surface. The patient was a man, aged thirty-nine years, who for three years had worked exclusively at varnishing. The shellac he used was mixed with Columbia spirits, containing about 95 per cent. of methyl alcohol. Previously he had worked but three or four days at a time at shellacing, but for two months prior to his blindness he had been exposed to the fumes daily. He had frequently noticed attacks of dizziness, vertigo, and, as he expressed it, "drunkenness" when he shellaced in enclosed spaces, particularly in warm weather; but no such attack had been experienced within two weeks prior to his blindness. The clinical features of the attack were the same as have been noted after more acute poisoning with this drug. The onset of blindness was quite sudden; there was a period of partial recovery, but in the end the blindness became quite complete. This patient, beside inhaling the fumes, had been accustomed to wash the stains from his hands, and sometimes had washed his face in the wood alcohol.—*Ophthalmic Record*, June, 1901.

A. BIRCH-HIRSCHFELD (Leipsic), from an experimental study of the action of methyl alcohol upon the visual apparatus of dogs and chickens, concludes: That the appearances of degeneration are presented in the nerve-cells of the retina before any alteration can be found in the trunk of the optic nerve. Later the degeneration is found in a certain part of the section of the nerve, but not involving all the bundles. The degenerated portions of the optic nerve show no signs of an inflammatory process, neither exudation, infiltration, nor alteration of the vessels. Both in its clinical aspects and anatomical changes methyl alcohol poisoning closely resembles that produced by ethyl alcohol.—*Graefe's Archiv für Ophthalmologie*, Band lii., Heft 2.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

CHARLES HARRINGTON, M.D.,

ASSISTANT PROFESSOR OF HYGIENE, HARVARD MEDICAL SCHOOL,

AND

EDWARD F. WILLOUGHBY, M.D.,

OF LONDON.

Dissemination of Bacteria by Ordinary Air Currents.—An extensive series of experiments by DR. R. F. HUTCHISON (*Zeitschrift für Hygiene und Infectionskrankheiten*, XXXV., p. 223) on the dissemination of bacteria in indoor and outdoor air and on the transmission of infection by mail yielded some interesting results. The organism used was *B. prodigiosus*, cultures of which, diluted with water, were sprayed into the air. A closed book with matches placed between the leaves so as to make openings 5 mm. in height, into which slips of sterile paper were inserted, was exposed for two hours at a distance of about eight feet from the place where the organisms were discharged into the air of the room, and then the papers were withdrawn and planted. The results were positive. Sheets of paper were exposed to the air and then placed in sterile envelopes and sent away by mail to both near and distant points, from which, without having been opened, they were immediately returned. In one case the round trip required twenty hours; in the other, six days. The sheet which made the shorter journey yielded an abundance of the organisms, but the other gave negative results. Hence infection by mail is possible, but the duration of life of the transmitted organism will, of course, depend upon the individual resistance of the particular species. Two sterilized sheets sent over the same routes and returned unopened as before, yielded in both cases a number of colonies of bacteria and moulds, thus showing that infection of letters in transit is, to some extent, possible.

Bacteria sprayed upon objects in the form of minute droplets were found to perish in a short time, the main factor in their destruction being the influence of sunlight. On Petri plates protected from the light, *B. prodigiosus* was found active after seven days, while in those exposed to it for one or two days no living organisms were found. Wall-papers, especially those with a rough surface or raised patterns, may become extensively infected in a very short time from an atmosphere into which bacteria are discharged by spraying, but most of the organisms were found to live but a short time.

When the air of the room was allowed to remain undisturbed, most of the organisms were found to have settled out within half an hour; but it was observed that slight unavoidable air currents in the lower strata will keep numbers of them in suspension for considerable periods. Other factors which may influence the length of time bacteria may remain in suspension are the amount of moisture present and the size and specific gravity of the organisms. Provided the air currents are favorable, suspended bacteria may be con-

ducted through very narrow crevices. Thus Petri dishes placed in closed bureau drawers became infected, the organisms having been conveyed through the surrounding chinks.

Experiments were performed to ascertain to what extent bacteria resting upon the floor and in the cracks between the boards thereof are thrown into the upper air by the act of walking, and it was found that those thrown up by the elastic rebound of the boards failed to infect plates suspended at a height of 10 cm., while those much nearer were extensively infected. Other experiments proved the passage of bacteria from one room to another through the keyhole and crevices of the closed door leading from one to the other. While the danger of disseminating bacteria by walking over an infected floor was shown to be slight, ordinary sweeping was found to contaminate the atmosphere through its whole extent, even to the ceiling; hence, dry sweeping is to be carefully avoided in the sick-room. Rapid passage from an infected atmosphere in a straight line will draw bacteria along through considerable distances. In the open air, collections of bacteria are inclined to float along in a more or less concentrated mass, even in an apparent calm, and may be carried by very slight currents of air as far as 600 metres.

A somewhat similar series of experiments by Dr. F. Kirstein (*Zeitschrift für Hygiene und Infectionskrankheiten*, xxxv., p. 123) yielded results closely in agreement with those of Hutchison. Kirstein concludes that the ordinary air currents which occur in dwellings cannot detach living organisms from surfaces upon which they have become deposited and dried, but concedes that, when bacteria in culture media are sprayed upon fine dust particles, they may, in some instances, be disseminated, since dust is so readily blown about. Yet how slight the danger of this method of infection is, so far at least as typhoid fever is concerned, is shown by the marked rapidity with which the typhoid organisms die when sent forth in the form of spray. The longevity of organisms varies enormously, according as they are dried in compact masses or well spread out. The non-spore builders, when thrown into the air in the finest droplets, as when sprayed, retain their vitality for only a comparatively short time, because of the direct influence of light and air, the time varying, of course, according to species. The marked sensitiveness of the tubercle bacillus to the influence of light makes the early destruction of this organism most probable when it is thrown into the air in the form of minute droplets, and thus can be explained the fact that even in consumptive wards, in which there is without doubt a constant discharge of the bacilli into the air, attempts to detect living organisms in the dust, etc., fail, excepting in those cases in which the sputum itself has, through lack of care, become disseminated. In the same way can be explained why infection does not oftener occur among the associates of consumptives who constantly cough—chiefly because of the rapid death of the bacilli when exposed in the finest droplets.

Sanitary Significance of the Colon Bacillus in Drinking Water.—The truth of the assertion of W. Kruse that the colon bacillus is in no way characteristic of fecal matter, and exists everywhere, in the air, water, and soil, and of the statement of Miquel that one can always find it in water, provided a sufficient volume is examined, is, to a certain extent, borne out by a

research conducted by Dr. J. Weissenfeld (*Zeitschrift für Hygiene und Infectionskrankheiten*, xxxv., p. 78) under the direction of Professor Kruse. Thirty waters of good character and twenty-six of bad were examined for the organism, and in every specimen it was found present, though the amount of water from which it could be isolated differed widely. With bad waters and with many good ones (from deep-driven wells for example) as well, the organism could be found in each cubic centimetre; but most of the good specimens yielded it only when large volumes were planted. The results of animal experimentation followed no rule. It happened sometimes that the bacilli from good waters were very pathogenic to guinea-pigs, while those from bad waters might be quite indifferent. Pathological and bacteriological examination of animals which were killed by cultures from good and bad waters revealed no differences, the results being the same in both classes as are observed in experiments with fecal bacteria. Hence it cannot be asserted that the finding of virulent colon bacilli in drinking-water necessarily indicates fecal contamination.

The Importance of Uncooked Vegetables in the Spread of Parasites and Infectious Diseases.—Dr. G. Ceresole (*Il Policlinico*, 1900–1901, p. 55) records additional evidence of the possible danger of the spread of parasites and infectious diseases through consumption of uncooked vegetables. He obtained lettuce, endives, radishes, and celery as sold in the market after the usual method of cleaning, and washed them in sterilized water. On examination of the sediment the microscope revealed an extensive fauna and flora. Among the objects observed were amœbæ, thread worms, eggs of tænia, oxyuris, and anchylostomum, and a great variety of micrococci, streptococci, staphylococci, bacilli, and sarcinæ. He isolated *B. coli communis*, a bacillus which agreed in characteristics with that of typhoid fever, the bacillus of tetanus, and *B. septicus*. As a precaution against danger, he advises that vegetables which are to be eaten uncooked be first washed and then immersed for half an hour in a 3 per cent. solution of tartaric acid, which agent has been shown to have the power to disinfect completely salad vegetables artificially infected with the spirillum of cholera.

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All communications should be addressed to

Dr. Francis R. Packard, 1831 Chestnut Street, Philadelphia, U. S. A.

Or

Dr. Hector Mackenzie, 34 Upper Brook Street, Grosvenor Square, London, W., England.

CONTENTS.

ORIGINAL COMMUNICATIONS.

PAGE

Filarial Lymphatic Varix. By Eugene L. Opie, M.D. 251
Granular Degeneration of the Erythrocyte. By C. Y. White, M.D., and William Pepper, M.D. 266
Report of an Interesting Case of Aneurism of the Internal Carotid Artery. By Walter B. Johnson, M.D. 273
Hydatid Disease of the Breast. By Robert G. Le Conte, M.D. 276
A Contribution to the Pathological Anatomy of Sporadic Cretinism. By Frederick A. Packard, M.D., and Alfred Hand, Jr., M.D. 289
Pseudomembranous Inflammation of the Mucous Membranes Caused by the Pneumococcus. By Charles Cary, M.D., and Irving Phillips Lyon, M.D. 298
Acute Splenic Miliary Tuberculosis. By D. D. Stewart, M.D. 309
Note Upon a Case of Cardia Duplex in a Turkey. By Allen J. Smith, M.D. . 317

REVIEWS.

A Practical Treatise on Diseases of the Skin. For the Use of Students and Practitioners. By James Nevins Hyde, A.M., M.D. 321
Pulmonary Consumption, Pneumonia, and Allied Diseases of the Lungs. By Thomas J. Mays, A.M., M.D. 322
Operative and Practical Surgery. For the Use of Students and Practitioners. By Thomas Carwardine, M.D. (Lond.), F.R.C.S. 324
The Blood and Its Diseases. By James Ewing, M.D. 325
Introduction to the Study of Medicine. By G. H. Roger, M.D. 326
Studies in Human and Comparative Pathology. By Woods Hutchinson, A.M., M.D. 327
Atlas and Epitome of Labor and Operative Obstetrics. By Oskar Schaeffer, M.D. 328
Anatomical Atlas of Obstetrics, with Special Reference to Diagnosis and Treatment 328
Atlas and Epitome of Ophthalmoscopy. By Prof. Dr. O. Haab 329
Text-book of the Practice of Medicine. By Dr. Hermann Eichhorst . . . 329
A Book of Detachable Diet Lists. By Jerome B. Thomas, A.B., M.D. . . . 330
A Text-book of Pharmacology and Therapeutics, or the Action of Drugs in Health and Diseases. By Arthur R. Cushny, M.A., M.D. 331

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

PAGE

Joint Affections in Scarlet Fever . 333
Typhoid Bacilli in the Blood . . 334
Bence-Jones' Albumosuria . . 334
The Relation of Diabetes Mellitus to Lesions of the Pancreas . . . 336
Tuberculosis of the Pericardium . 337

SURGERY.

PAGE

Treatment of Joint Tuberculosis . 339
Urotropin 340
Enlargement of the Inguinal Glands 341
Contribution to Study of Hæmothorax 341
Urotropin as a Urinary Antiseptic . 341
Calculus of the Prostate . . . 342
Report of Brain Tumors and Cysts . 342
Röntgen Rays in Urinary Calculi . 344
Spinal Cocainization in Surgery . 345
Luxation of Peroneous Tendons . 345
Hysterical Tympany 346
Luxation of the Median Nerve . . 346
Some Errors in Diagnosis in Conditions Resembling Appendicitis . 347
Treatment of Malignant Tumors by the Anticellular Serum of Wlaeff . 347

PEDIATRICS.

Death due to Hypertrophy of Thymus 348
Diazo Reaction in Diphtheria . . 349
Value of Widal Reaction in Infancy 350
Malaria in Children 350
A French View of Infantile Scurvy . 351
Repeated Lumbar Puncture in Cerebro-spinal Meningitis . . . 351
Prophylactic Injections of Diphtheria Antitoxin 352
Leucocytosis in Measles . . . 352

THERAPEUTICS

Caffeine and Theobromine . . . 354
Santonin in Locomotor Ataxia . . 355
Intramuscular Injections of Calomel for Gonorrhœal Rheumatism . . 355
Sodium Cacodylate in Tuberculosis . 355
Phthisis Treated with Duotal . . 356
Zomotherapy in Phthisis . . . 356
Lupus and Urea 356
Antityphoid Serum 356
Intestinal Lithiasis 357
Treatment of Typhoid Fever . . 358
Cinnamon in Influenza . . . 358
Hæmaturia following Use of Urotropin 358
Fatal Sulphonal Poisoning . . 358

OBSTETRICS.

Eclampsia and the Thyroid Gland . 359
Bacteria in the Feces 360
Sterilization of the Hands . . . 360
Pemphigus Vesicles in the Newborn 361
Placental Development . . . 361
Pregnancy and Ventral Fixation . 362
Treatment of Pruritus Vulvæ . . 362
Puerperal Septic Infection. . . 362
Maternal Treatment of Syphilis . 364
Three Cæsarean Sections . . . 364
Two Fatal Cases of Pregnancy . . 364
Puerperal Phlebitis 365

GYNECOLOGY.

Recurrence in Abdominal Cicatrix 365
Emphysema of the Skin . . . 366
Antipyrine and Salol 366
Resection of Urethra in the Female . 366
Pelvic Abscesses 366
Atmokausis 367
Injuries to the Vagina . . . 367
Ureteral Invagination . . . 367
Transplantation of the Ureter . . 368
Treatment of Diseased Adnexa . 368
Nasal and Pelvic Affections . . 368
Gynecological Examinations . . 368
Pelvic Hæmatocele Due to General Hyperæmia 369

OTOLOGY.

Chronic Otorrhœa 369
Acute Purulent Otitis Media . . 370
A Case of Agoraphobia . . . 370
The Organ of Hearing in Purpura Hemorrhagica 371
Otogenous Pyæmia 371

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

Historic Records 372
Conjunctiva, Nose, and Throat . . 372
Nasal Lesions after Middle Age . 373
Chancre of the Septum of the Nose . 373
Saddle Nose 373
Malignant Intranasal Growth . . 373
Nasal Hydrorrhœa 373
Syphilitic Hydrorrhœa . . . 374
Case of Sphenoidal Sinusitis . . 374
Cardiac Stricture of the Œsophagus . 374
Œsophagotomy 374
Parotitis 374

PATHOLOGY AND BACTERIOLOGY.

The Question of Experimental Granulomata 375
The Parasitic Theory of Cancer 375